Recreational Residence
Aquatic Resource Assessment

Zigzag Ranger District
Mt. Hood National Forest

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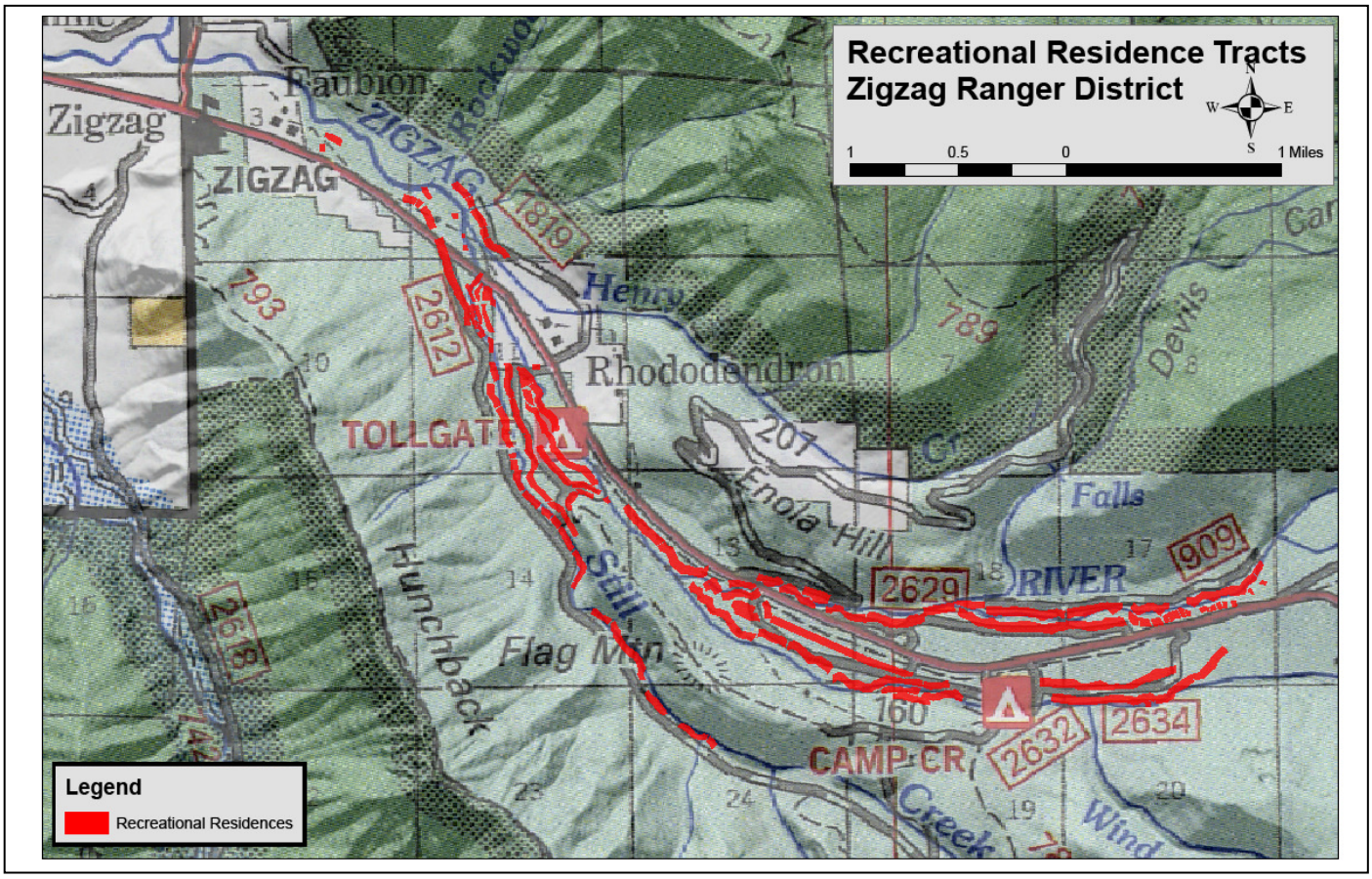
Figure 1. Map of the recreational residence tracts located on the Zigzag Ranger District.



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Introduction

The USDA Forest Service, Mt. Hood National Forest (FS), is conducting a Consistency Review for the reissuance of Special Use Permits for 554 recreational residences located on the Zigzag Ranger District. This is a multi-year process evaluating if use of the recreational residences should be continued, modified or halted. Recreational residences are located on National Forests across the United States. Somewhat unique to the Mt. Hood National Forest, compared to other permit re-issuance processes currently underway, is that greater than 80 percent of the recreational residences on the Zigzag Ranger District are located along creeks or rivers that are inhabited by several stocks of anadromous fish that are currently listed under the federal Endangered Species Act (NOAA 2005). This includes the fish species Chinook salmon (*Oncorhynchus tshawytscha*), coho salmon (*O. kisutch*) and winter steelhead (*O. mykiss*). Other fish species of interest are Pacific lamprey (*Lampetra spp*.), cutthroat trout *(O. clarki clarki*) and rainbow trout (*O. mykiss*).

The distance from creeks or rivers to recreational residences varies. Some are located on the first or second floodplain terrace and are disconnected from fluvial processes by their elevation or distance. Others however, are within 20 to 50 lineal feet of the wetted channel edge and in the active floodplain. While the majority of the lots are located along streams or rivers, only a small subset of the total that are within one tract pose potential impacts to aquatic resources, as our analysis shows. Described in this document is the methodology used to determine the amount of change or influence of the recreation residences to natural processes such as coarse woody material recruitment and associated large wood (LW) routing and storage, side channel development or floodplain connectivity and, ultimately, risk of debris torrents resulting in channel migration. Furthermore, several stream reaches located within or adjacent to recreational residence tracts have been identified as providing important fish habitat (SRBWG 2005), and restoration of these aquatic areas is a Forest priority.

This report provides a brief watershed description of the Zigzag River fifth-field and each of the sixth-field tributaries. The report:

- Analyzes possible effects to aquatic resources and watershed processes from existing recreational residences
- Contains a flood hazard assessment for identified lots and cabins
- Provides a hierarchical approach that builds on clear rational for conclusions
- Identifies critical needs and limitations of the assessment

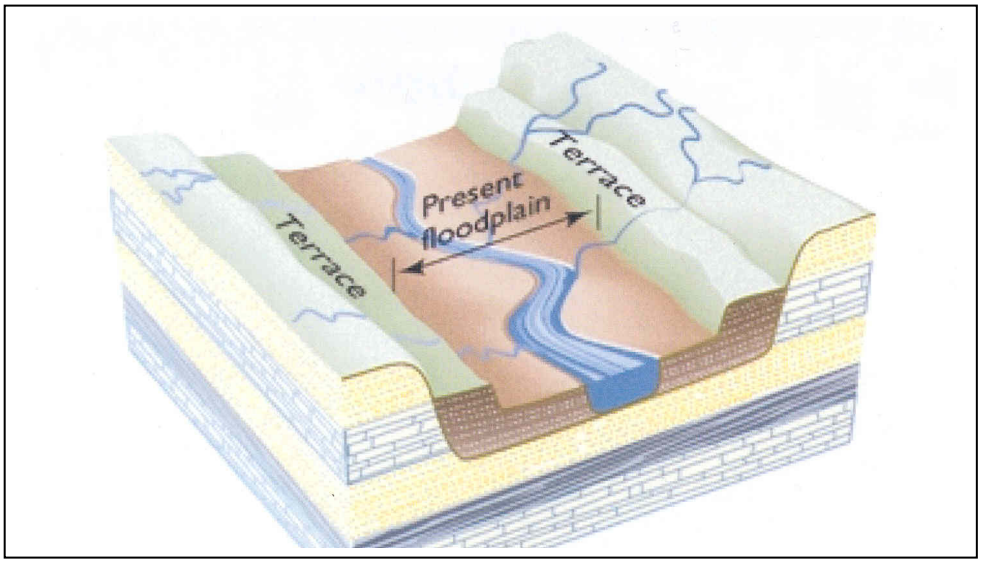


Figure 2. Graphical depiction of floodplains, terraces and river channels.

History of the Recreational Residence program on the Zigzag Ranger District

The recreational residence program began in 1915 on the Mt. Hood National Forest. Tracts were platted up to the early 1960's, ending with 10 tracts all located on the Zigzag Ranger District. A tract is a geographical grouping of lots, ranging from 17 within the Old Oregon Trail Tract to 158 lots in the Mile Bridge Tract. When the recreational residence program was founded, the goal was to encourage use of newly established National Forest System lands.

Typically, each lot is approximately 0.25 to 0.5 acres in size. Lot size may vary in position, local topography or proximity to other lots. Most recreational residences receive their potable water from one of two domestic water systems; Lady Creek Water District and Rhododendron Summer Home Association. The exceptions are lots 101 to 167 of the Cool Creek Tract, which receives domestic water from pumps or by carry-in practices. Recreational residences can be up to 1,200 square feet in size with a maximum height of 26 feet. The lot can contain one additional structure and an outhouse. Other authorized lot improvements are variable from permit to permit and may include such items as a driveway, culverts, waterlines, septic systems, single tread trail, footbridges and parking for up to two vehicles. Permits require natural vegetation composition and structure to be maintained on each lot. Most lots are occupied by mid-seral stands of Douglas-fir and western red cedar with small patches of remnant old growth trees. Cabins must be occupied for at least 15 days per year but shall not be used as a full-time residence to the exclusion of a home elsewhere. Average use of cabins is about three to four weeks per year, while the remainders of the calendar year cabins are vacant.

Recent Basinwide Analysis

In recognition of the important aquatic resources of the Sandy River, the Sandy River Basin Working Group (SRBWG) was formed in 1998. Formed by 12 federal, state, and county agencies and several non-governmental organizations (NGOs), the goal of the SRBWG is to restore native fish populations within the Sandy River basin (see www.sandyriverpartners.org). The SRBWG has been instrumental in completing several basin-scale analyses outlining historic and existing conditions and future restoration potential. Initial modeling included use of *Ecosystem Diagnosis and Treatment Model* (EDT) that was published in the Sandy River Basin Characterization Report in 2005 (SRBP 2005). The EDT model is a species-habitat relationship model used extensively on the Pacific west coast for resident and anadromous salmonids (SRBP 2005). The EDT model uses 46 habitat condition variables for every river reach for existing and historic conditions, based on range of natural variation. The model has several biological rules and algorithms for each of the habitat variables based on known fish life history and production. A model run will produce an interpretation of the difference between existing conditions and of historic conditions. Cumulative impacts are tallied as juvenile fish move downstream to the Columbia River and Pacific Ocean and then as they return as adults to their natal stream to spawn. This type of model links habitat features to biological elements of fish and wildlife species. The EDT model provides a detailed depiction of the aquatic environment and how the target species may perform.

In 2004, the SRBWG group had grown to include several more agencies and NGOs. The SRBWG group completed the *Sandy*

Sandy River Basin Working Group
Portland General Electric
NOAA Fisheries,
US Fish and Wildlife Service
Sandy River Basin Watershed Council,
Oregon Trout,
Oregon Department of Fish and Wildlife,
Association of Northwest Steelheaders,
The Nature Conservancy, Portland Water Bureau,
Bureau of Land Management, Department of Environmental Quality,
Clackamas County,
Trout Unlimited.

River Basin Anchor Habitat Report (SRBWG 2004). In this report, anchor habitat is defined as '*distinct stream reaches that currently harbor specific life history stages of salmon and steelhead to a greater extent than the stream system at large*' (see www.ortrout.org/pdf/SandyHabRpt.pdf). The report evaluated empirical data, professional judgment data, and EDT model data. These data were then input into a decision-support model to numerically score individual reaches to further support anchor habitat designations. Species richness and biodiversity are widely used as indicator of ecological health (SRBWG 2004). Reaches that are anchor habitat for multiple species may have the highest ecological integrity (SRBWG 2004).

In 2006, the SRBWG completed the *Sandy River Basin Restoration Strategy (see* www.ortrout.org/pdf/Sandy%20Resto%20Strategy%20WEB.pdf *)*. The SRBWG used a *hierarchical framework* (Roni et. al. 2003) to identify the sequence for implementing restoration actions in individual watersheds. This framework was adopted to ensure that appropriate types of restoration actions are identified and the appropriate sequence of implementation is conducted to address the primary changes and alterations in watershed processes responsible for the factors limiting salmon and steelhead production. This hierarchical framework focuses the necessary attention towards ensuring restoration actions are taken to ameliorate the root causes for these habitat deficiencies.

Spring Chinook salmon, coho salmon and winter steelhead are fish species of interest serving as biological cornerstones within the Sandy River Basin. Several miles of important habitat for these species are located within river reaches adjacent to, or downstream of the recreational residence tracts. Important aquatic and physical requirements of these species include cool clean water, access to deep, loosely arranged gravel for spawning, and deep pools with cover and complexity for rearing and feeding. In-stream channel complexity is provided by logs, whole trees, roots and boulders. Side channels provide important refuge during high flows, containing slow water havens for juvenile fish. Unimpeded flows during the spring and early summer assist pre-adult fish, referred to as smolts, in their downstream migration to the estuary and ocean (USDA 1990-2007). Salmon and Steelhead smolts stay in the ocean, growing into adults over 1.5 to 5 years before migrating back to their natal streams for spawning.

Several reaches within the Zigzag River fifth-field watershed adjacent to recreational residences have been designated anchor habitats and are summarized in Table 1. Within the Zigzag River 5th fifth-field watershed, only three reaches area designated as anchor habitat reaches. Other stream reaches along the recreational residence trace in the Zigzag River fifth-field watershed were not found to be anchor habitats. One reach, Still Creek Reach Two, also ranked high as a Composite Anchor Habitat, meaning it provides important habitat to multiple species of salmon and steelhead.

Table 1. Anchor Habitats by reaches within the Zigzag 5th field Watershed.

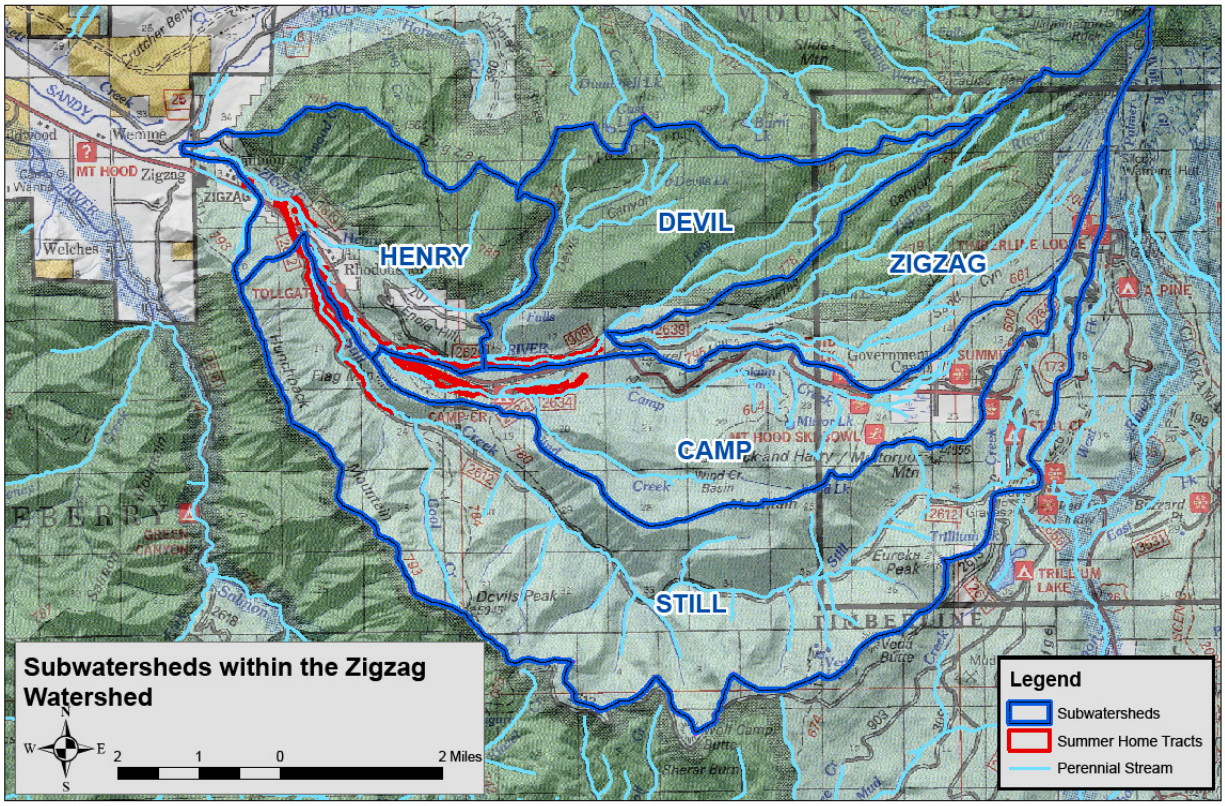
Stream Reach	Chinook Salmon	Coho Salmon	Winter Steelhead	Composite Anchor Habitat
Still Creek, Reach 1	X		X	
Still Creek, Reach 2	X	X	X	X
Still Creek, Reach 3			X	

Watershed Description

Zigzag River 5th Field

All the recreation residences are located in the Zigzag River fifth-field watershed. The Zigzag River Watershed is approximately 37,730 acres in size and is a tributary located in the upper portion of the Sandy River basin. Major tributaries within the Zigzag River watershed include Still Creek, Camp Creek, and Henry Creek (Figure 3). The Zigzag River originates from the Zigzag Glacier, carves its way through volcanic debris flow in the upper watershed, and then travels westerly through central portions of the watershed's volcanic debris, terminating in alluvium near its confluence with the Sandy River (USDA 1995). Still Creek originates below Palmer Glacier from a series of springs on Mt. Hood's west side (USDA 1995). Camp Creek originates from a series of springs and wetlands above the town of Government Camp. Henry Creek is formed from a series of springs and snowmelt originating off of Zigzag Mountain (USDA 1995). In the spring of each year, the Zigzag River becomes turbid from glacial melt-water while Still Creek, Henry Creek and Camp Creek remain clear-water tributaries.

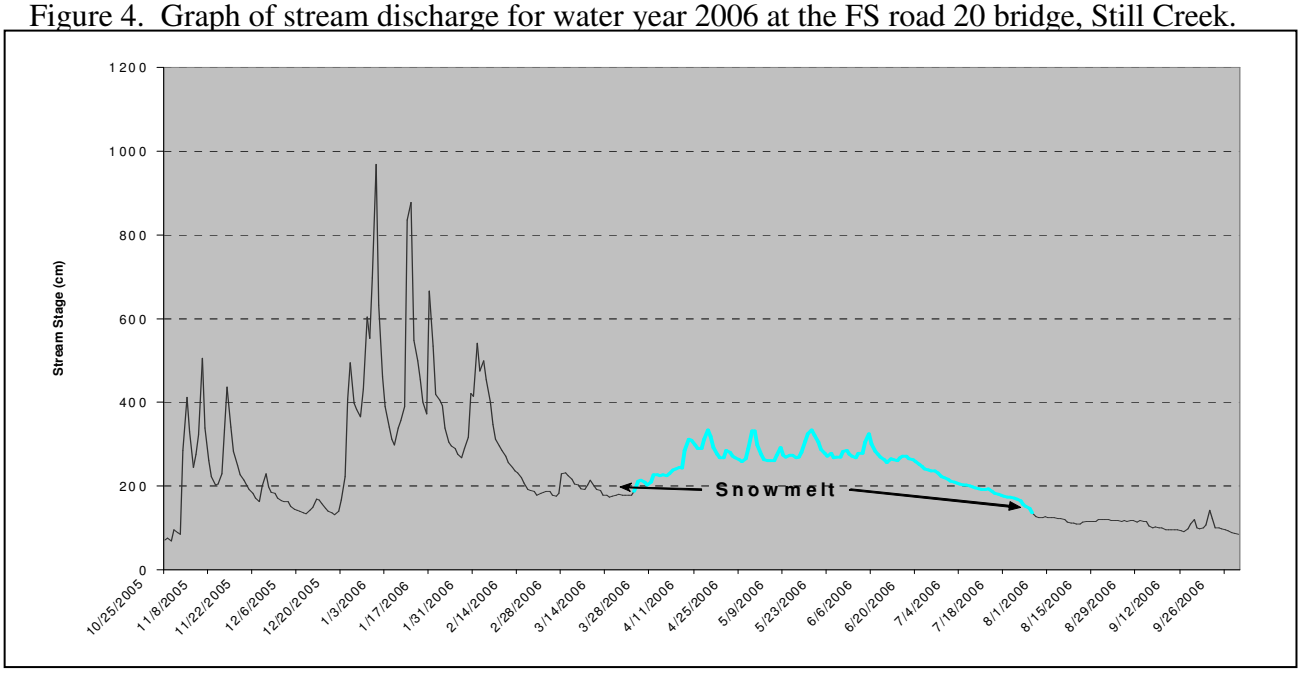
Figure 3. Map of subwatersheds of the Zigzag Watershed.



Stream discharge into the Zigzag River, Camp Creek and Still Creek is fed by year-round snowpack that exists at the highest elevations (USDA 1995). Average daily discharges are substantially influenced by rates of snow accumulation and snowmelt within the Zigzag River Watershed. Occasional spikes in the hydrograph during December and January are common from high flows associated with rain-on-snow events (Figure 4). Peak stream flows in the Zigzag River Watershed

appear to be on a decreasing trend, likely attributed to the increased canopy closure and size of stands after fire events from the early 1900s (USDA 1995).

Figure 4. Graph of stream discharge for water year 2006 at the FS road 20 bridge, Still Creek.



The elevation of the Zigzag River Watershed ranges from 1,400 to 10,000 feet (USDA 1995). Annual precipitation ranges from 130 inches at its highest elevation to 65 inches in the lower Still Creek drainage. The landforms and soils within the watershed are formed on relatively young geologic surfaces. The geology of the toeslopes and sideslopes of the watershed's western portion consists of weak rocks that originated from volcanic debris flows. On the ridges above these slopes, more resistant volcanic flow rock caps the weaker material (USDA 1995).

Three main vegetation zones occur within the watershed: Western Hemlock, Pacific Silver Fir and Mountain Hemlock, typical of forest types west of the Cascade Crest. The watershed's current vegetative conditions are mainly even-aged, moderately dense stocked 80 to 100 year-old Douglas-fir and western hemlock dominated stands. Approximately 29.8 percent of the watershed is in early seral stand conditions, 49.1 percent is in mid-seral stand conditions, 15.8 percent is in late-seral stand conditions and 5.4 percent is non-vegetated. This is mostly due to several large fires that burned over the watershed from 1917 to 1952 (USDA 2004).

European-Americans moved into the Zigzag River Watershed in the mid-1800s via the Barlow Road. Today, several small towns are present along U.S. Highway 26 the original Barlow Road travel route. These include Government Camp, Rhododendron, Welches and Zigzag. Land ownership in the Zigzag River Watershed is approximately 97 percent Forest Service and three percent private.

Zigzag River 6th Field

The Zigzag River Subwatershed is approximately 6,390 acres in size and the channel has been segmented into two geomorphically unique river reaches. Reach one extends from river mile (RM) 0.0 to RM 2.2. Reach two extends from RM 2.2 to 7.3. Reach one is slightly entrenched with an average gradient of two to three percent. According to the Zigzag River Watershed Analysis (USDA

1995), the dominant channel substrate is cobble and small boulder. The bankfull channel width is 60 to 70 feet. The flow regime is a combination of glacial runoff and spring fed systems as it mixes with water from Still Creek. Salmonid habitat is dominated by moderately steep riffles with lateral and pocket pools associated with boulders and LW. The lower 1.5 miles of reach one has three to four side channels and off-channel habitats providing juvenile rearing conditions as well as an increase in the number of pools greater than three feet deep. The 1991 stream survey noted low amounts of LW in all reaches of the Zigzag River. Likely reasons include past stream clean-out activities that preceded the 1964 flood, past fire history and the moderately steep, high-energy character of the channel that likely moves most LW episodically (Sandy River Basin EDT 1999). Most of the riparian stands along the Zigzag River are fully stocked, with a multi-layered canopy of Douglas-fir, western red-cedar and western hemlock.

Reach two is moderately entrenched as it cuts through old pyroclastic mudflow deposits of sand, boulder and small cobble providing little to no side channel or off-channel habitat for salmonid rearing. These types of reaches have the potential to be very unstable due to the compounding effects of the unstable landform on the unstable channel typed (USDA 1995). Dominant channel substrate is cobble and small boulder. Average channel gradient is four percent with a bankfull width of 50 to 60 feet. The flow regime is similar to glacial runoff systems with turbid low-flow and generally buffered peak flows with occasional outburst floods and infrequent rain-on-snow events (USDA 1995).

Still Creek 6th Field

The Still Creek Subwatershed is approximately 14,412 acres in size, and the channel is segmented into three geomorphically unique stream reaches. Reach one begins at RM 0.0 and extends to RM 1.0. Reach two begins at RM 1.0 and extends to RM 3.2. Reach three begins at RM 3.2 and ends at RM 7.3. Reach one is moderately entrenched with an average gradient of 2.5 percent. The dominant channel substrate is small boulder and cobble. The average bankfull channel width is 59 to 65 feet.

The 1996 stream survey noted small amounts (1.1 pieces per mile) of LW. The lack of LW is primarily due to past stream clean-out activities, firewood and hazard tree removal and to a lesser degree, the slightly steeper stream gradient. Past restoration actions completed during 1982 and 1983 and again in 1996 was the primary reason any LW was present. Though stream flow in Still Creek originates from subsurface flow associated with Palmer Glacier, its stream flow regime is heavily influenced by the numerous small tributaries located upstream. Consequently, the flow regime is more stable, similar to a spring-fed system and minimally turbid.

Reach two is slightly entrenched being well connected to its floodplain. Dominant channel substrate is gravel and small cobble. Average channel gradient is 1.5 percent with an average bankfull width of 44 to 46 feet. The stream flow regime is similar to that of reach one. The 1996 Still Creek Stream Survey noted 15.8 pieces of medium and large size in-channel LW per mile. This low amount is attributed to past stream clean-out actions, hazard tree and firewood cutting and possible interruption of natural routing within Still Creek and from upstream sources.

Reach three is slightly entrenched and is well connected to its floodplain. Dominant channel substrate is gravel and small cobble. Average channel gradient is three percent with an average bankfull width of 44 to 46 feet. The stream flow regime is similar to reach one. The 1996 Still Creek Stream Survey noted small amounts of medium and large size in-channel LW per mile.

Camp Creek 6th Field
Camp Creek Subwatershed is approximately 6,225 acres in size and is a tributary to the Zigzag River, entering at RM 3.7 (USDA 1994). It is segmented into two geomorphic stream reaches. Reach one is from RM 0 to 0.4 and reach two is from RM 0.4 to 4.0. Reach one is slightly entrenched as it meanders across the floodplain and terrace of the Zigzag River. Dominant channel substrate is gravel, with an average channel gradient of five percent. Average bankfull channel width is approximately 29 feet. The stream flow regime is similar to that of a snowmelt and spring-fed system. The 1994 stream survey noted low amounts of LW (Sandy River Basin EDT 1999). Yokum Falls, located at RM 5.75 is a full fish-passage barrier. Camp Creek has been documented as having high amounts of fine sediment from road sanding (USDA 1995).

Reach two is moderatly entrenched, cutting through old mudflow deposites of boulder, cobble and sand. Dominant channel substrate is cobble and small bolder with an average gradient of four percent. Average bankfull channel width is approximately 30.0 feet. The stream flow regime and amounts of in channel LW are the same as reach one.

Henry Creek 6th Field
Henry Creek Subwatershed is approximately 4,994 acres in size and is a tributary to the Zigzag River entering at RM 2.0 (USDA 1995). Reach one begins at the mouth of Henry Creek, is 1.5 miles long, and ends at a set of 30 foot falls. Henry Creek is slightly entrenched, flowing through large remnant old growth stands of Douglas-fir and western red cedar. Dominant channel substrate is gravel and cobble with an average gradient of two point five percent at the lower end to eight percent near the upper end of the reach. Average bankfull channel width is approximately 22 feet. The stream flow regime is similar to that of a snowmelt and spring-fed system. The 1995 stream survey noted low amounts of LW (Sandy River Basin EDT 1999). Henry Creek is likely an important tributary, acting as a clear-water refuge for rearing salmonids during those times of the year when glacial meltwater makes the Zigzag River turbid.

Assessment Objectives

The objectives for this assessment are to:
- Develop a hierarchical framework for aquatic analysis to use on all 10 recreational residence tracts on the Zigzag Ranger District.
- Develop a step-wise approach to document consistency of recreational residence with current management direction.
- Identify recreational residences that may be causing adverse effects to aquatic resources, floodplains and fish habitat.
- Identify recreational residences that are in the floodplain or debris flow areas and may be at risk of damage or catastrophic loss

Methods

Watershed and fisheries personnel from the Zigzag Ranger District collected physical and aquatic data between 2005 and 2008. Data and information used in this analysis include photogrametry, Geographical Information System (GIS) and specific field data collection for ten recreational residence tracts. During this time, each lot was visited, site conditions assessed, and when appropriate, photos

taken and cataloged. A hierarchical framework (HF) was developed in partnership with personnel from NOAA Fisheries for this analysis to facilitate a transparent, step-wise approach that aids in the assessment of aquatic resources at the tract and lot level. Following are the steps used in the HF and an associated flow chart depicting this process (Figure 5).

1. Assessment of consistency with current management direction at the Tract level.
We evaluated, at the tract level, existing management direction, policy, Northwest Forest Plan (NWFP) and Mt. Hood National Forest Land and Resource Management Plan (LRMP) direction and land allocations. The Zigzag District Ranger determined if the current use of each tract, at the tract scale, is consistent with current management direction or if it may not be consistent.

2. Detailed assessment of each recreational residence lot
We evaluated each lot and associated infrastructure locations within the valley. We identified impacts to aquatic resources and inconsistencies with LRMP Standards and Guidelines. We identified and delineated any nearby stream (intermittent or perennial) or wetland feature, documenting channel form, and type of each feature and it's proximity to each lot. We estimated if any infrastructure is within the floodplain. We used the 1995 and 2004 Zigzag Watershed Analysis to highlight altered processes and functions within the Zigzag Watershed. We validated initial assessments during the November 2006 flood. An evaluation of compliance with the Terms and Conditions of each Special Use Permit was made as well as remedies were prescribed for corrective actions. Development of a summary table for each lot with relevant Standards and Guidelines from the LRMP was completed.

3. Collection of site-specific floodplain data
We identified those lots with their associated infrastructures occurring within the 100-year floodplain. We collected representative channel cross sections in areas where infrastructures are likely within the 100-year floodplain. Delineation of the flood inundation zone was also completed. We compiled historic aerial photo data series and completed valley bottom photo interpretation.

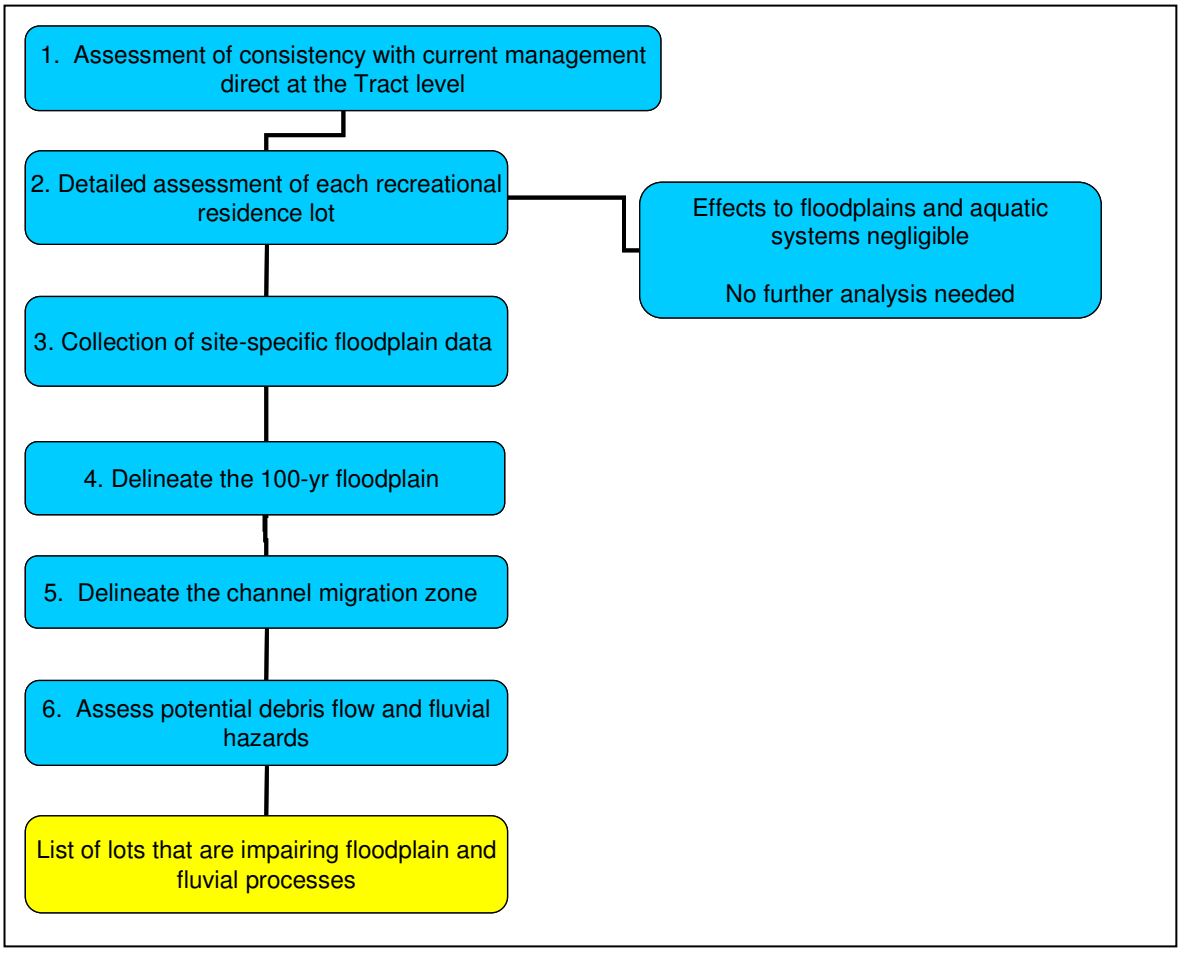
4. Delineation of the 100-year floodplain
We used site-specific channel cross section data in the Army Corps of Engineer's HEC-RAS model (USACOE 2002) to delineate the 100-year floodplain. The model was then calibrated and validated using field collected data during the November 2006 flood. We used the 10-meter Digital Elevation Model to develop an integrated HEC-RAS model of the 100-year floodplain. We collected and used historical records from Special Use Permit files and other sources such as the Flood Hazard Analysis: Upper Sandy River and Tributaries report (USDA, 1976).

5. Delineation of the channel migration zone
We used aerial photo interpretation techniques to delineate the channel migration zone using historic photos and geo-referencing known hard points on the landscape (large persistent rock features etc.) to create a consistent base template. Components used for delineation included evaluation of channel migration, interpretation of velocity vectors (via HEC-RAS), interpretation based on on-site evaluation of channel geometry and meander, existence and proximity of tributaries to infrastructures, interpretation of debris flow/fan zone and historic evidence of flooding from debris flow zone.

6. Assess potential debris flow and fluvial hazards
We identified potential debris flow hazard areas and proximity to specific lots and associated infrastructure. We collected and used information from several sources that included: Special Use Permit files, aerial photos, GIS mapping, and professional judgment to delineate areas of hazard. We then identified critical fluvial processes that are impaired or that are likely impacted by occupancy of

the debris flow zone. Examples of these are: deposition of LW and sediment from tributaries debris flows, lateral channel migration and recruitment of LW into stream channels.

Figure 5. Flow chart of aquatic analysis for the recreational residence permit reissuance.



Results

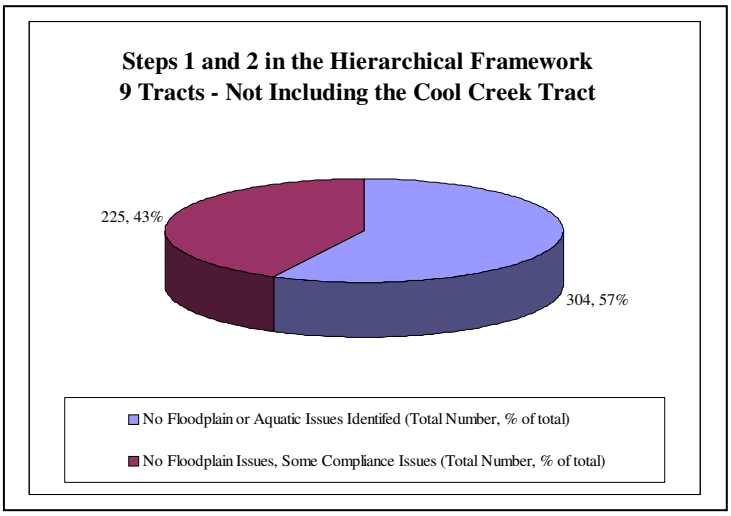
1. Assessment of consistency with current management direction at the Tract level.
The Zigzag District Ranger found that all 10 tracts were consistent with current management direction, as outlined in the Mt. Hood National Forest Consistency Review (USDA 2006). The Consistency Review is not a decision (therefore it is not subject to appeal). However, it is the first administrative step in a process that will serve as the basis for formulating a proposed action concerning continuation of recreation residence use. Furthermore, this assessment focused on current management direction from the 1990 Mt. Hood National Forest Land and Resource Management Plan (LRMP) as amended by the 1994 Northwest Forest Plan (NWFP). The LRMP deemed this is a valid use of USFS lands and has given specific direction to their management through Developed Recreation (A10) Land Allocation with the goal to, "*Provide a range of high quality outdoor recreational opportunities for concentrated recreational use at readily accessible, appropriately designed developed sites*" with specific Standards and Guidelines for their management (USDA, 1990). Other land allocations that give direction include the General Riparian Area Management (B7) and Special Emphasis Watershed Management Area (B8) land allocations for the lower Still Creek Watershed. The NWFP also

provides specific land allocations to those areas of the Zigzag River Watershed that include Late Successional Reserves (LSRs) and Riparian Reserves (RR). Both of these land allocations do not preclude the continued existing of Recreational Residence tracts.

2. Detailed assessment of each recreational residence lot

Each of the 554 Recreational Residence lots was surveyed by watershed or fisheries personnel during the period from 2005 to 2008. Each lot within riparian reserves was assessed and site-specific data was collected, tabulated on a designated lot form (Appendix A). Digital photos were taken when critical riparian or compliance issues were identified. Types of data collected for each lot include: identification of stream channel (intermittent, perennial or ephemeral), horizontal and vertical distance from infrastructure to the stream channel, channel type and form, approximation of infrastructure location within floodplains, amount and effect to native vegetation, identification of septic type and location, compliance with Terms and Conditions of the special use permit, and consistency with key LRMP Standards and Guidelines.

Figure 6. Summary chart of steps 1 and 2 in the HF.



Of the 10 tracts located on the Zigzag Ranger District, nine did not require further site specific analysis because there was no adverse modification to floodplains or aquatic resources identified. Any negative effects to aquatic resources were negligible or discountable and could be addresses through special use permit compliance enforcement. This encompasses 529 lots located in the following tracts: Still Creek, Camp Creek, Vine Maple, Old Oregon Trail, Flag Mountain, Zigzag Ski Club, Mile Bridge and Tollgate. Of the 529 lots, 304 had no aquatic issues identified (Figure 6). There were 225 lots with documented permit compliance issues with respect to aquatic resources that will be dealt with administratively. Examples include cutting of native vegetation or planting of non-native grass or ornamental trees and shrubs.

The remaining Tract, Cool Creek, includes 25 lots. Ten of these lots had no floodplain issues identified but did have some permit compliance issues that will be addresses through special use permit compliance enforcement. Examples of these include cutting or pruning of native conifer trees or removal of native vegetation. The remaining 15 lots had floodplain and other aquatic issues identified. Examples include: location within the 100-year floodplain or possible impacts to side channels.

In early November 2006 there was a 10 to 25-year rain generated flood in the Sandy River Basin. Based on stream stage at the FS Road 20 bridge, it was determined that this event was a 25-year recurrence interval stream flow event in Still Creek. During high flows, field surveys were completed to validate initial modeled assessments made by district watershed and fisheries personnel. Surveys recorded water surface elevations, wetted side channel locations and impacts to recreational residences. Digital photos were taken of several residences (Appendix C). Surveys validated initial assessments and confirmed many of the structures in the Cool Creek Tract are within the 100-year floodplain.

3. Collection of site-specific floodplain data

Within the Cool Creek Tract, 12 channel cross sections were established and data collected to characterize channel and floodplain geometry and roughness, vegetation boundaries, and structure location. Aerial photos from 1958, 1967, 1979, 1984, 1995 and 2005 were evaluated. Identification of the November 2006 flood elevation and wetted width or inundation zone was documented.

4. Delineation of the 100-year floodplain

A site-specific delineation of the 2, 25, 50 and 100-year floodplain using cross-sections and the Army Corps of Engineer's HEC-RAS model, Version 3.1 was developed. Reach specific delineation of the 100-year floodplain factoring in valley form between cross-sections using valley cross sections, 10 meter DEM and GEO-RAS was also developed (see Figure 7 as an example). A compilation of historical records of flooding from permit files for each lot within the Cool Creek Tract was assembled (Appendix D). The HEC-RAS modeling and findings were reviewed and validated by Natural Resource Conservation Service employees familiar with the intricacies and workings of the model.

There were 12 sites evaluated with individual HEC-RAS analyses based on cross sections adjacent to structures of concern. Figure 7 details the HEC-RAS output for Lot 141 showing the 100-year flood elevation, water velocity associated with the 100-year flood elevation, and the location of the structure of concern. The accompanying panoramic photo details the site where the cross section was measured. Table 2 displays findings for individual HEC-RAS analyses for the Cool Creek Tract.

Figure 7. Site-specific HEC-RAS analysis for lot 141 representing estimated water velocity at the 100-year flood elevation for Still Creek. Approximate location of the cabin is shown in yellow.

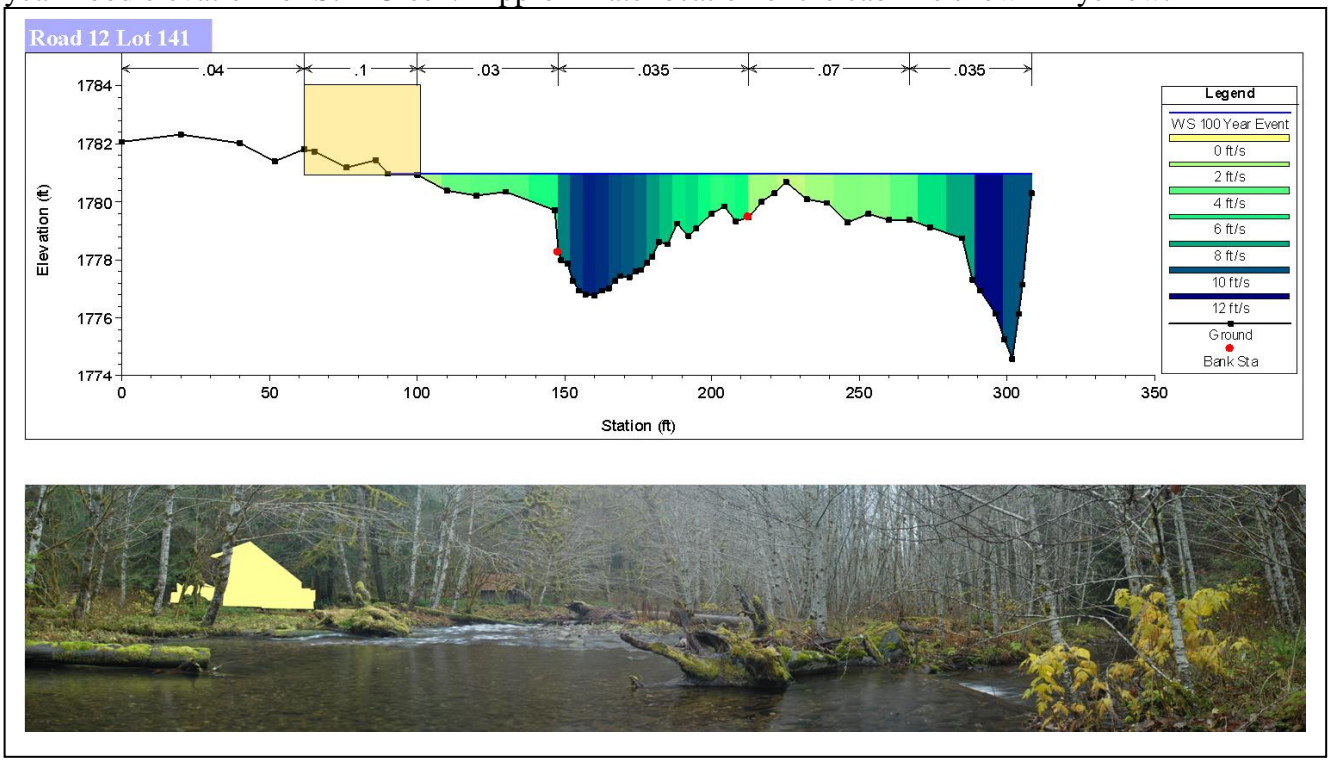
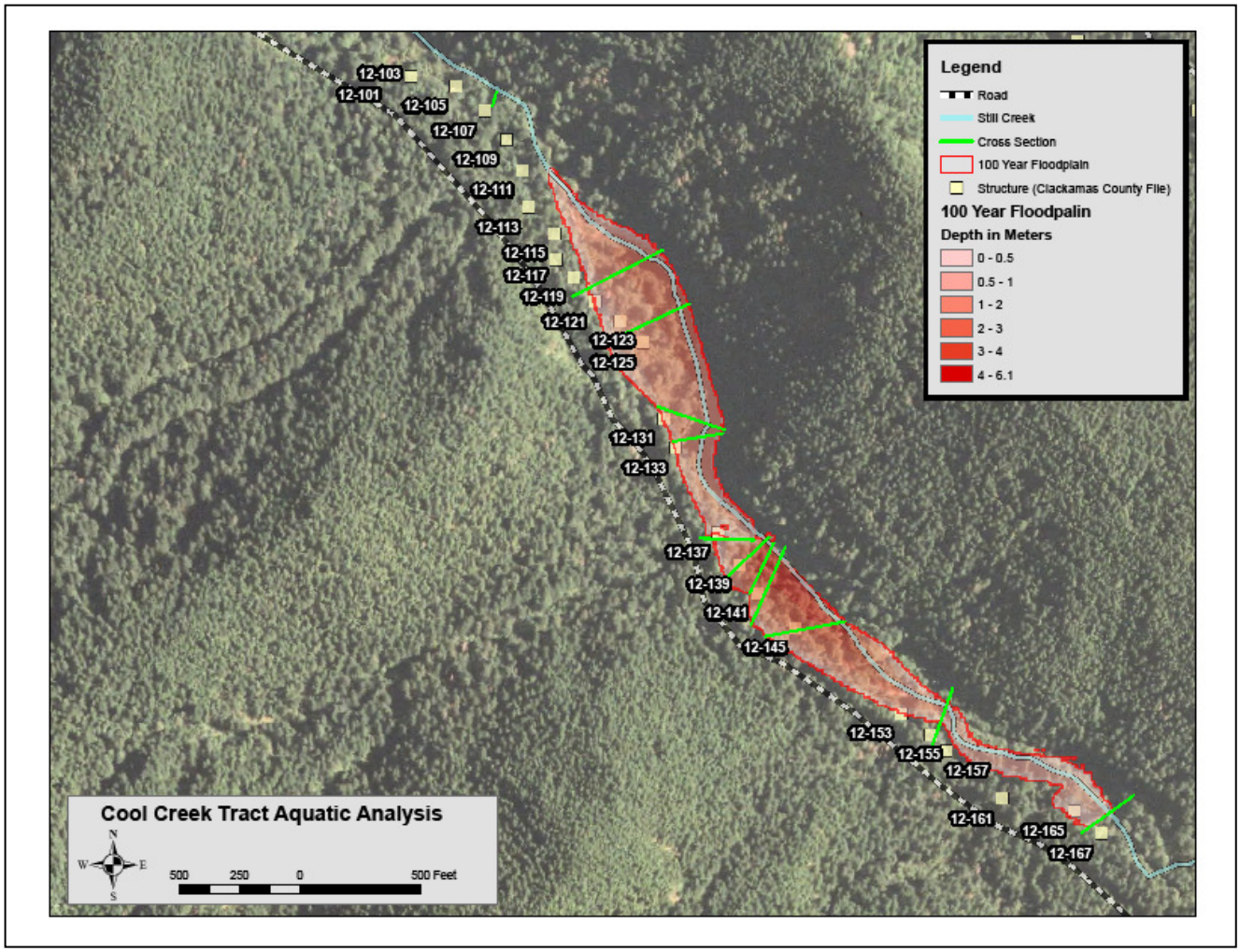


Table 2. Evaluation of specific lots of the Cool Creek Tract and identification of structures within the 100-year floodplain.

Recreational Residence Cabin Number	Cross Section Completed	Structure within the 100-year floodplain
121	X	No
123		Yes
125	X	No
131	X	Yes
133	X	No
137	X	No
139	X	Yes
141	X	Yes
145	X	Yes
153		No
155	X	No
157		No
161		No
165		No
167	X	Yes

Figure 8 is a GEO-RAS summary of the 100-year floodplain within the Cool Creek Tract, depicting estimated river depth during a 100-year flood event. The summary does not detail the floodplain at lot 167 because there was no channel cross section established upstream of the lot as required by the model. Based on professional judgment, model outputs and local topography it is believed that lot 167 is within the integrated 100-year floodplain.

Figure 8. Integrated floodplain map for Still Creek and the Cool Creek Tract.



Each of the special use permit files for the Cool Creek Tract were examined for records of past flood impacts. Table 3 summarizes those lots with historic flooding identified. Following is a summary from the permit file for lot 141, as an example. For a complete list of comments from permit files see Appendix D.

ca. 1963	Construction of cabin completed.
9/28/66	Cabin has been identified in a “flood danger zone”.
9/22/77	Site plan indicates that stream channel is approximately 50’ from cabin.
11/1995	High water event. Lattice skirting on cabin was ripped off. Stream entered the old channel upstream around a log jam turning lot into a “raging river”.

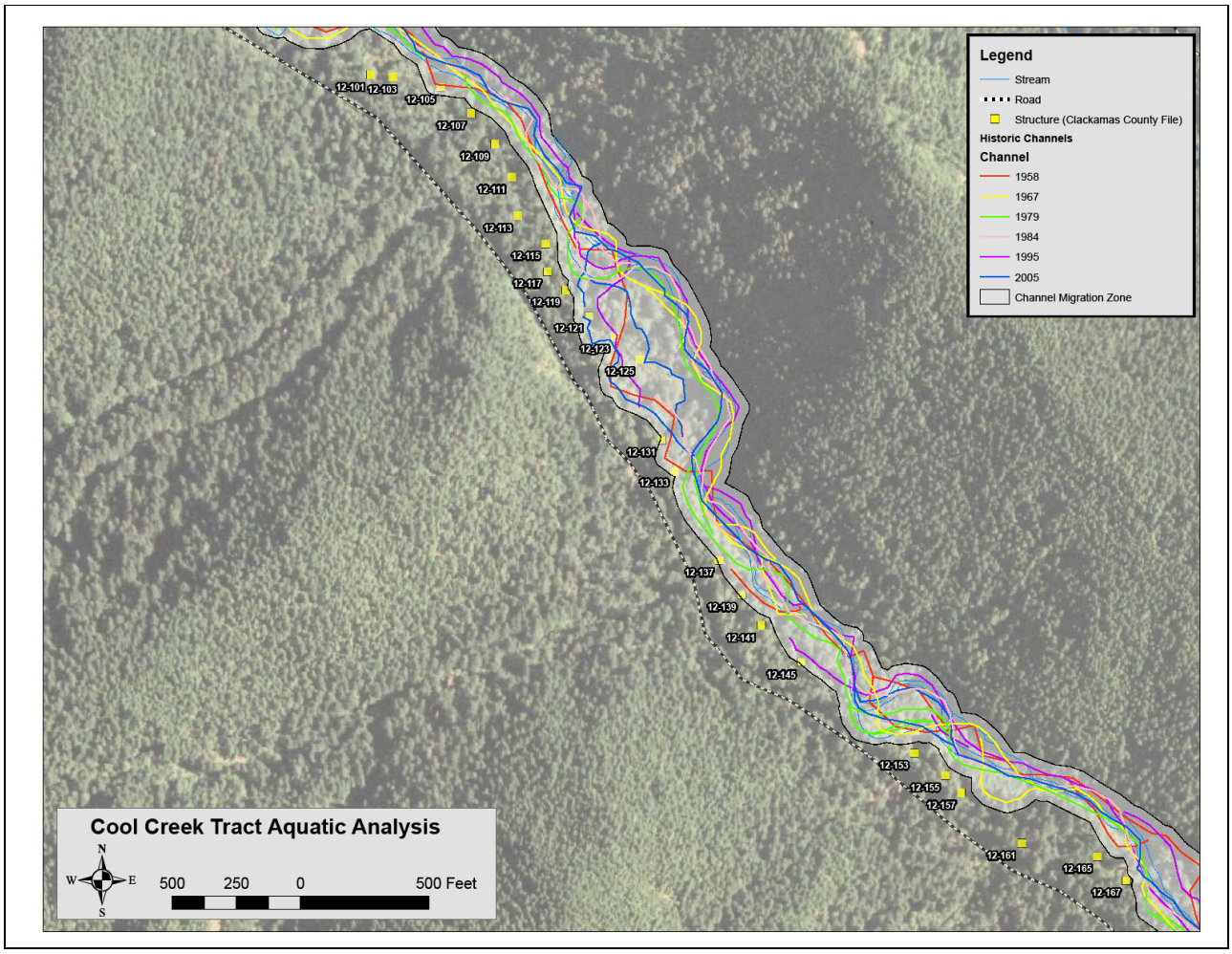
Table 3. Recreational residence lots with flooding identified within the special use permit file.

Recreational Residence Cabin Number	Historic Record of flooding from permit file
121	X
123	
125	
131	X
133	X
137	
139	X
141	X
145	X
153	
155	X
157	
161	
165	
167	X

5. Delineation of the channel migration zone

Aerial photos of the Cool Creek Tract from 1958, 1967, 1979, 1984, 1995 and 2005 were used to display channel position over time. Each photo was scanned and matched to the base image in GIS. The Still Creek channel centerline in each photo was delineated. Channel boundaries were not identified because they were not visible over the entire length of study area and some photos had moderate distortion at the edges, thus skewing the alignment. Any side channels that were apparent on the photos were also delineated. Geo-reference photos were overlaid on the 2005 ArcGIS National Agriculture Imagery Program image and plotted to display the centerline of the channel since 1958. Risk (low, medium or high) of channel migration was assessed. Once the channel centerline was established on each photo, 40 lineal feet was added to each side to graphically depict the bankfull width (USDA 1995). It is believed this represents a conservative estimate of the actual area wetted with bankfull flows (Figure 9). The channel migration zone dimensions were not modified due to roughness elements such as large trees, bedrock or other rock outcropping.

Figure 9. Channel migration zone for Still Creek from 1958 to present, within the Cool Creek Tract.

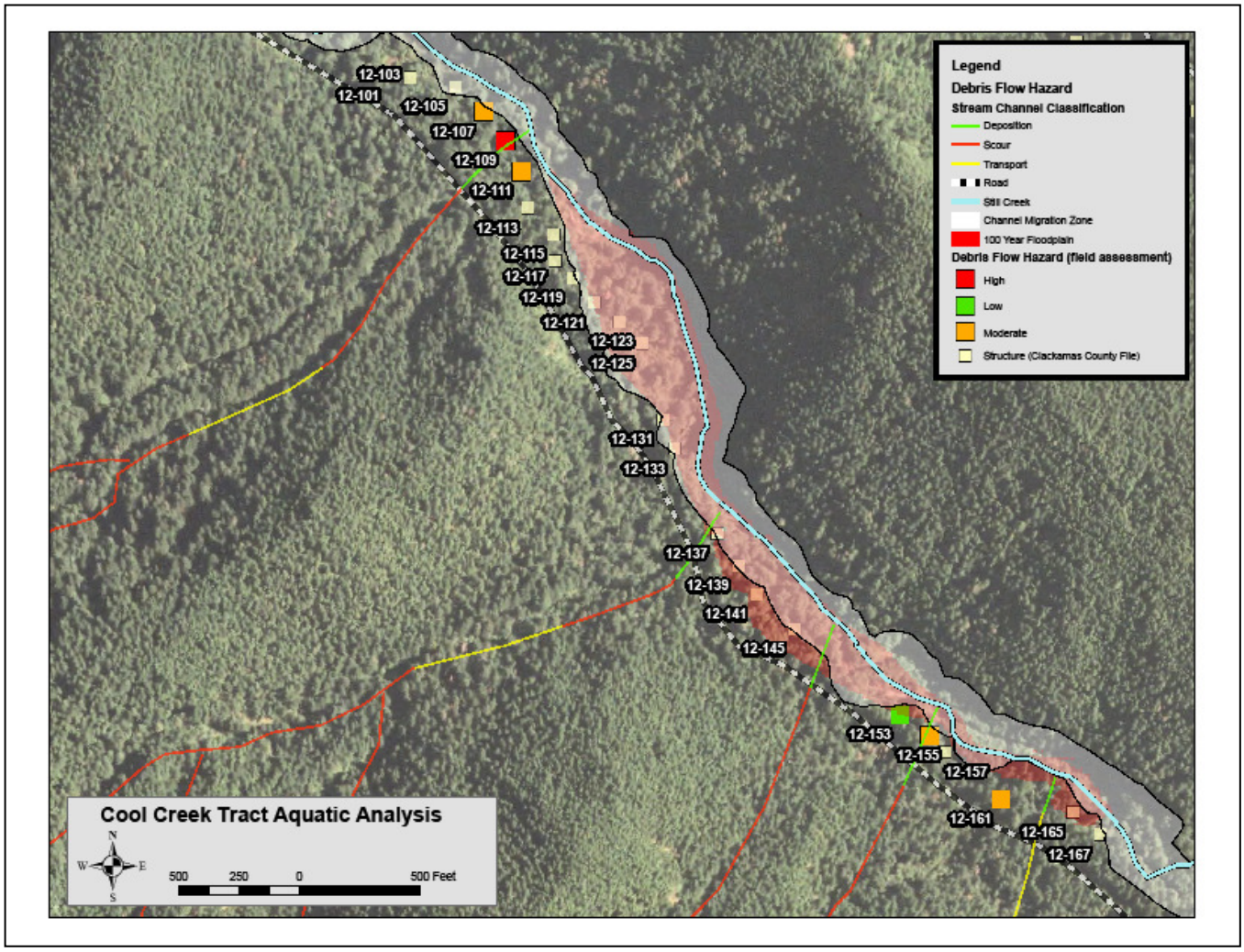


6. Assess potential debris flow and fluvial hazards

Five "debris flow prone" tributary channels were identified within the Cool Creek Tract. The debris flow prone tributaries originate on the steep slopes of Hunchback Mountain and cross the Cool Creek Tract before reaching Still Creek. Debris flows initiate from hillslope landslides that reach tributary channels or from the mobilization of channel material in very steep confined channels. Usually debris flows initiate during intense rainfall events. LW and sediment also moves downstream from upper Still Creek. Project and permit files, aerial photos, field surveys, GIS mapping, and professional judgment were used to delineate potential hazard areas. Figure 10 displays these findings and their approximate location on the landscape. Critical fluvial processes that are impaired or that are likely impacted by recreational residence occupancy of the floodplain and or debris flow zone are as follows:

- Delivery of LW and sediment to Still Creek and its associated floodplain
- Interception of debris from tributaries into Still Creek
- Lateral channel migration across the floodplain is limited by constructed dikes
- Moderate to high chances of bank erosion due to changed stand condition, structure and species composition from vegetation management adjacent to the channel and floodplain surface
- Accessibility to and evolution of side channels

Figure 10. Debris flow hazards from tributaries along Still Creek, within the Cool Creek Tract.



Discussion

Recreational residences are a valuable asset to National Forest system lands. Over time they have encouraged the public to visit and recreate on public land. Though management and political directions have changed since these cabins were first build on the landscape starting in the early 1910s and 1920s, the original intent of these special use permits have not. Within the last 10 to 15 years aquatic and watershed sciences have been given new tools for analysis which has shed insight on possible effects these structures may have on the landscape and aquatic environment. In this same timeframe new management direction, laws, and policy such as the Northwest Forest Plan, and listing of several species of salmonids under the Endangered Species Act (ESA), have set new standards for which to analyze as well.

Upon starting this analysis there was an underlying need to be clear and consistent to assess possible recreational residence impacts to rivers, streams, wetlands or floodplains and associated effects to ESA listed fish, fish habitat and water quality. As important is the need to assess and inform permittee's of identified hazards due to such things as flooding or debris flows.

This analysis integrates identified processes and understanding of the Still Creek Watershed to highlight those lots and cabins that are at-risk and pose negative impacts associated with channel migration, flooding, LW and debris routing and hillslope processes.

Examples from the 2006, 1999, 1996 and 1964 floods illustrate how variable flood effects are from event to event and from one watershed to the next. Variables may include the way a storm tracks and deposits precipitation in the watershed, the type of precipitation deposited, the saturation of the soil, the amount of existing roughness elements (vegetation, logs, rocks) along the channel boundary or how precipitation is delivered to the stream channels. These are but a few of many variables that dictate how sever a storm impacts the channel and floodplains. An example of variability was displayed during the November 2006 flood; the upper Sandy River experienced a 25 to 50-year recurrence interval flow while across the valley the Salmon River only experienced a 2 to 5-year event.

Through this analysis nine of the ten recreational residence tracts were found to have no adverse effects to floodplains or aquatic systems. This encompassed 529 of the lots and cabins located on the Zigzag Ranger District. However, approximately 225 did have compliance issues with their special use permit. Each of these permittee's will need to correct these issues within five years of the new 20-year permits being issued. This analysis was completed in steps one and two of the HF process. One recreational residence tract, the Cool Creek Tract, was identified as possibly impacting floodplains and aquatic resources. Because of that, a more intensive assessment of the entire tract was warranted. Once this was completed it was found that 10 of the 25 recreational residences within the tract had some permit compliance issues but those could be dealt with administratively. Those included cabins numbered 101 to 119. The remaining 15 required further assessment, steps three through six in of the HF process (Table 4).

In order to integrate and synthesize the analysis, a professional evaluation of channel migration with the potential impacts to recreational residences was included (Figure 11). This evaluation integrated results from previous analyses and factors in interactions between processes to come to conclusions. This analysis was completed in coordination with NOAA Fisheries personnel.

The next step in the HF analysis was an assessment of each of the remaining 15 lots to determine if adverse effects or hazards could be mitigated without moving those structures. Of the 15 lots outlined in Table 4, only lot 161 fit these criteria. Currently the cabin is located on the terrace above the floodplain of Still Creek, adjacent to an intermittent tributary. This tributary was one that was analyzed in the debris flow hazard rating (see Figure 10). Because of its location, cabin 161 is at moderate risk of damage due debris flows from the tributary.

The last step in the HF assessment was an assessment of each lot from Table 4 to evaluate if respective structures could be moved to a different location on the lot to mitigate adverse effects. Of the 14 lots left, only two possibly fit these criteria, lots 153 and 155. Upon further field review it was determined that given local topography, the proximity to Still Creek and the presence of several large diameter conifer trees there is not adequate space on either lot.

In summary, of the 15 lots identified in Table 4, 13 lots are at moderate or high risk of damage due to natural fluvial processes of channel migration, LW and sediment routing in Still Creek or debris flows from intermittent tributaries from Hunchback Mountain. Additionally, the presence of these structures is likely having negative effects to these processes as well, which include: limiting access to floodplains and side channels through the construction and maintenance of artificial berms, removal of LW and simplification of stand structure and composition. Routing and deposition of organic and

inorganic material from tributaries causes channel migration and reactivation of side channels and is interrupted by roads, driveways and other infrastructure not allowing deposition in Still Creek.

Figure 11, integrated map with professional evaluation of channel migration.

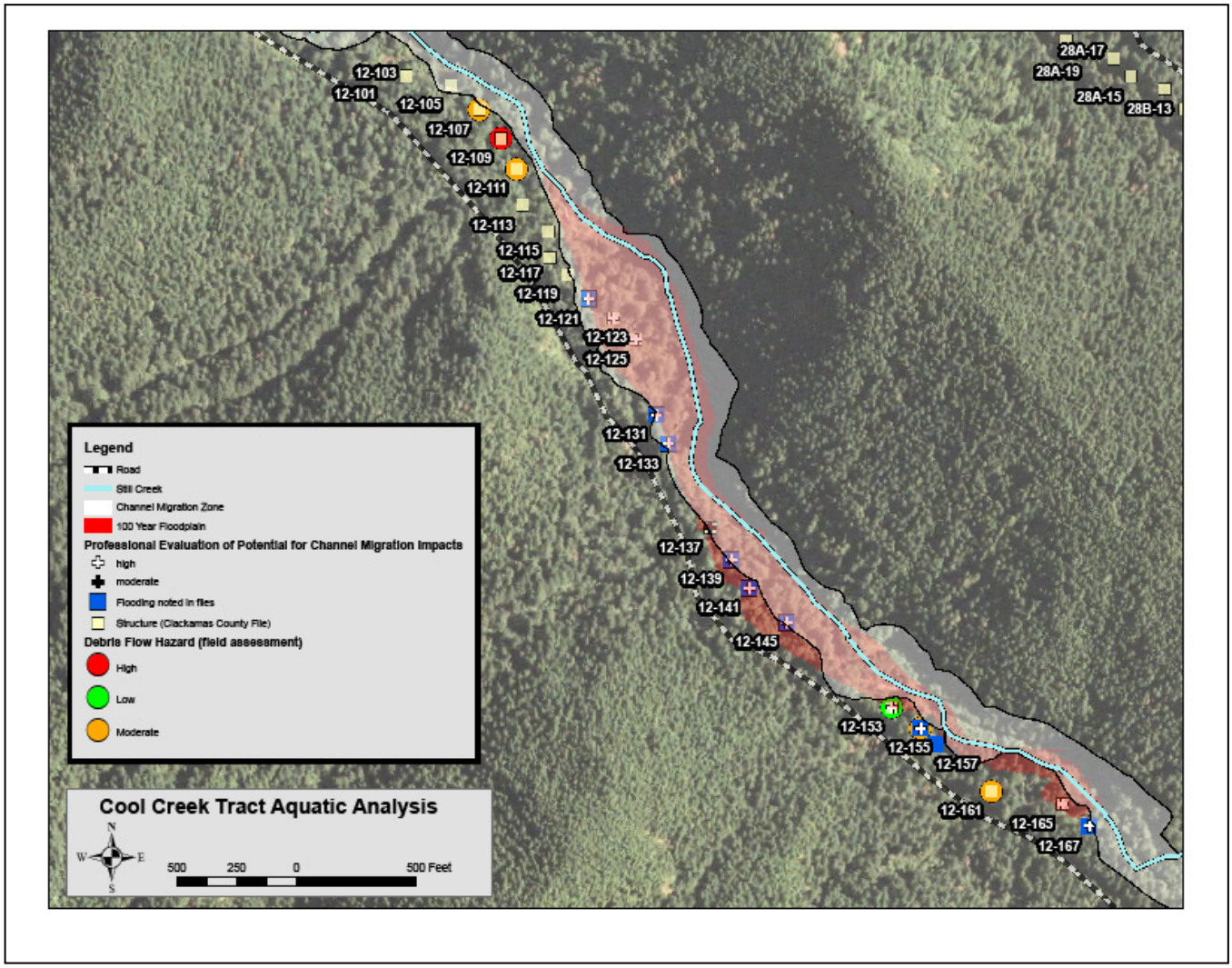


Table 4. Summary table of site specific analysis for portions of the Cool Creek Tract.

Recreational Residence Cabin Number	On-Site HEC-RAS 100-year Floodplain	Integrated HEC-RAS 100-year Floodplain	Historic Records of Flooding	Channel Migration Zone via Aerial Photo Interpretation	Potential Debris Flow Hazard	Professional Evaluation for the Chance of Being Affected by Channel Migration
121			2006			High
123						High
125						High
131			2006			High
133			2006, 1995			High
137						Moderate
139			2006			High
141			2006, 1995			High
145			1993, 1996, 2006			High
153					Low	High
155			1972, 1976, 1996		Moderate	High
157						Low
161					Moderate	Low
165						High
167			1981			High

	Cabin within 100-year floodplain, contains documented records of flooding in the permit file, or within the channel migration zone		Cabin's position in the 100-year floodplain or channel migration zone is borderline based on mapping

Fisheries

Still Creek supports runs of wild winter steelhead, spring Chinook salmon and coho salmon as well as resident rainbow trout, cutthroat trout, and sculpin. Because of several habitat features, water quality, valley and floodplain form these reaches also see disproportionally higher use by these fish for spawning and rearing as well (SRBWG 2004).

The Zigzag River Watershed Analysis Update (2004) discussed habitat modeling completed by SRBWG using the EDT model (SRBP 2005). A comparison of current and modeled historic anadromous salmonid runs for Still Creek is displayed in Table 5. As noted, current numbers are substantially lower than they were in the past. It is important to also note that current coho salmon adult population numbers are only 39 percent of historic production. Several life stages of coho salmon require low gradient stream channels connected to side channels with good complexity. Because they rear in freshwater for half of the life span, 18 months, the condition and abundance of this habitat greatly affects population numbers to outmigration smolts.

Table 5. EDT model results for the Still Creek 6th field watershed (SRBWG 2004).

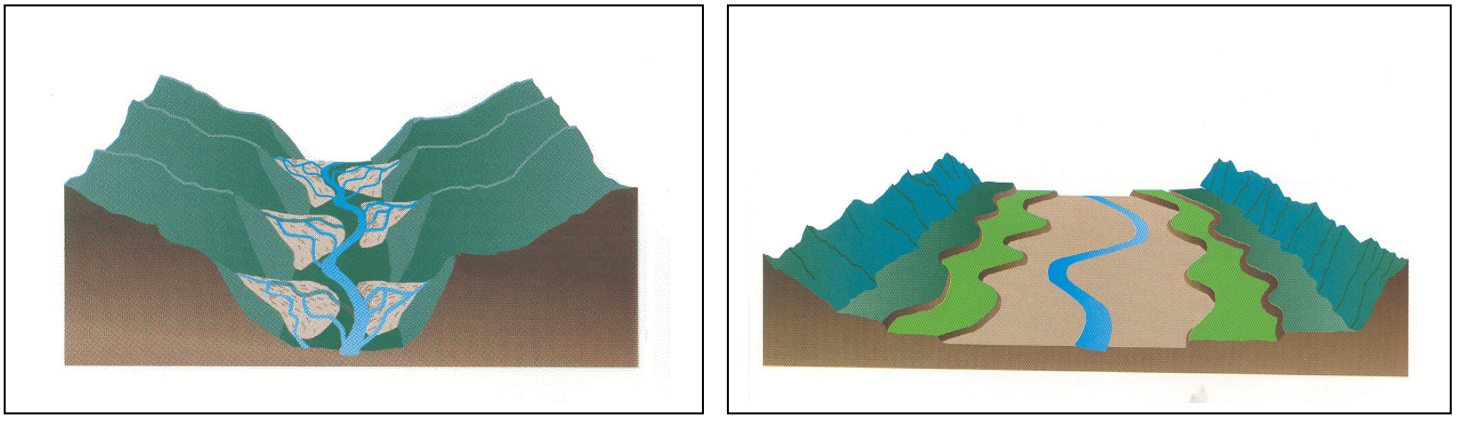
	Winter Steelhead		Spring Chinook Salmon		Coho Salmon		Total Historic Adults
	Current Adults	Historic Adults	Current Adults	Historic Adults	Current Adults	Historic Adults	
Still Creek 6th Field (% of historic production)	285 (66 %)	430	328 (56 %)	583	**164 (39 %)**	421	1434 (29.5% of 5th field production)

Valley and Stream Type

Still Creek is highly influenced by its valley type. The upper reaches are in narrow to gently sloping, moderately steep, colluvial valleys. These act to transport sediment, LW and debris (Rosgen 1996). The middle and lower reaches are in alluvial fans and debris cone valleys that see episodic pulses from associated tributaries (Rosgen 1996). Some of Reach two is also in a broader valley that has a well developed floodplain with adjacent river terraces (Montgomery and Buffington 1997). Examples of these valley types are displayed in Figures 12. Several of the recreational residences listed in Table 4 are built on or adjacent to debris cones.

Still Creek stream habitat is variable over its 15.5 miles of length; from its confluence with the Zigzag River to its headwater springs located on the south side of Mt. Hood. Some of the upper reaches are steep, greater than 8 percent, while others are low gradient, 1.5 to 2.0 percent. The Cool Creek Tract is located within the low gradient reach two (Figure 13). Typically, low gradient reaches are biological hot spots or areas of high production because streams are sinuous, connected to numerous side channels, contain low bank height ratios, have wider width to depth ratios, and are highly complex with abundant LW accumulations providing food and cover (Rosgen 2006). Specifically, juvenile salmonids use off-channel or side channel habitat as refuge during high winter stream flows and during the summer as feeding and rearing grounds. These types of stream channels can hold one or two orders of magnitude of fish compared to steeper, higher velocity channel types.

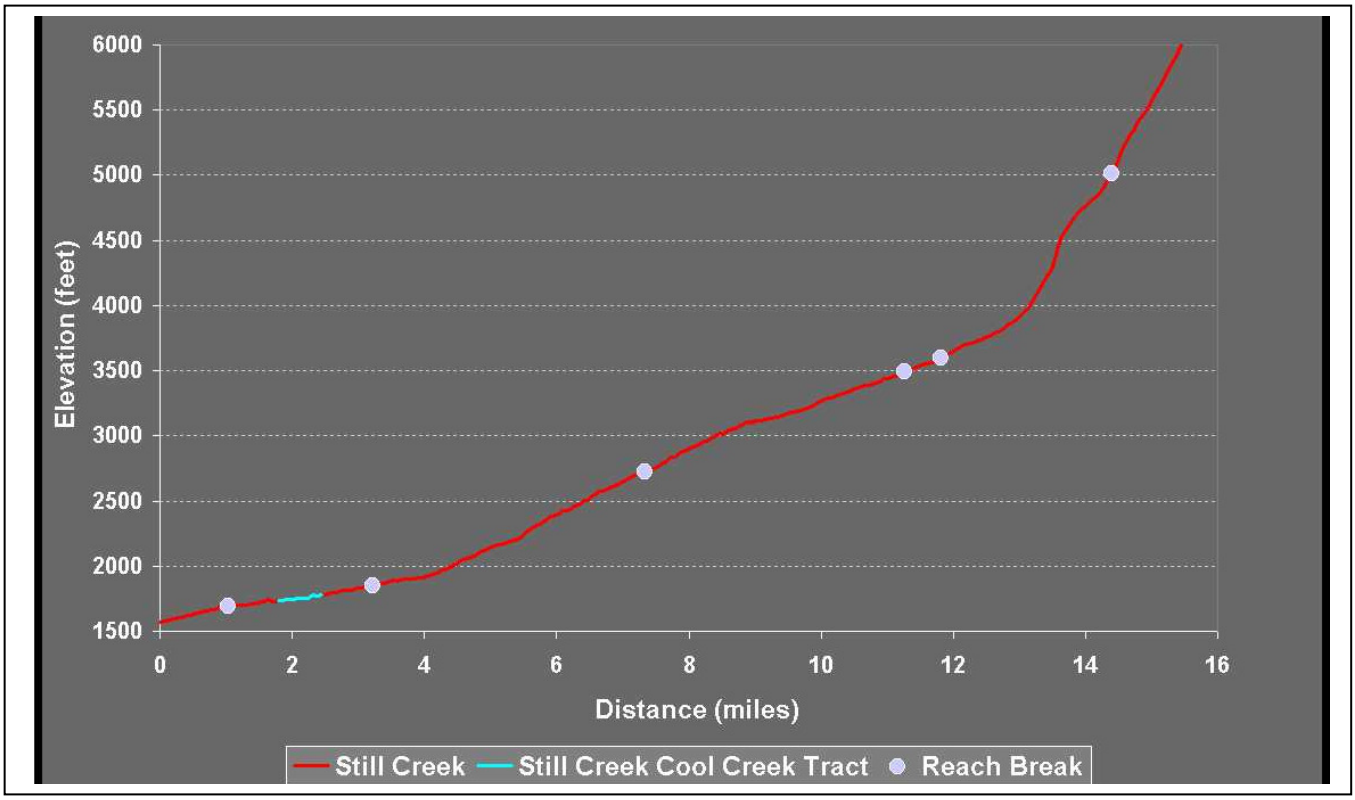
Figure 12. Examples of different valley forms within the Still Creek subwatershed (Rosgen 1996).



Still Creek is important within the Sandy River Basin because of the complexity of its stream type. The low gradient reach two is characterized as a Rosgen C3 channel type, dominated by cobble and gravel substrates, width to depth ratios of greater than 12, well defined pools and riffles with point bars

and frequent side channels. Still Creek reach two is characterized as having low bank height ratios, allowing good connectivity to its floodplain. Rosgen C channels in healthy conditions provide excellent habitat quality for anadromous and resident salmonids (Rosgen 1996).

Figure 13. Stream gradient of Still Creek, identifying the location of the Cool Creek Tract .



Within the Sandy River Basin there is approximately 170 river miles of accessible anadromous habitat (Table 6). Within the Zigzag River 5th field watershed and the Still Creek 6th field watershed there is approximately 25.0 miles and 11.2 to 11.8 miles of accessible habitat, respectively. Within the entire Sandy River Basin there is approximately 20 miles or less of low gradient, Rosgen C channel type. Still Creek accounts for approximately 5.3 of those miles or roughly 25 percent.

Table 6. Miles of anadromous fish habitat within the Sandy River basin.

Sandy River 4th field (EDT, 2004) Miles of Anadromous Habitat	Zigzag River 5th Field Miles of Anadromous Habitat	Still Creek 6th Field Miles of Anadromous Habitat	Miles of Rosgen C Channel Type in Sandy River Basin (approximately)	Miles of Rosgen C Channel Type in Still Creek
170	25.0	11.2 – 11.8	< 20	5.3

Sandy River Basin Aquatic Restoration Strategy

In 2007, the SRBWG published the Sandy River Basin Aquatic Restoration Strategy. The strategy '*provides a geographic focus and hierarchical framework for directing future investment toward high priority restoration needs that will aid in rebuilding of salmon and steelhead populations.*' It defines

specific restoration actions in priority watersheds necessary to address limiting factors and it ranked priority watersheds. Still Creek 6th field watershed ranked third for the entire Sandy River Basin behind the mainstem corridor and the Salmon River 5th field watershed. This ranking was a combination of many factors. The two most significant factors were the current habitat condition and the relative abundance of fish that use Still Creek. Current habitat conditions, though degraded, do provide adequate habitat for fish. Because of the valley and channel types of Still Creek, a substantial positive response would likely be realized due to restoration actions. High priority restoration actions would include the addition of LW to the channel, floodplain and side channels as well as conversion of degraded riparian stands to a multi-layered conifer dominated overstory. Additions of the LW would immediately improve habitat conditions for fish and would also improve stream processes by dissipating energy during flood events by allowing high water to better access the floodplain and side channels. Restoration of riparian stands from open shrub or hardwood dominated to that dominated by Douglas-fir, Western Red Cedar and Western Hemlock would be a long-term treatment to improve future LW recruitment potential as well as improve stream processes.

Occupancy of low gradient reaches along Still Creek by cabins and associated infrastructure precludes the opportunity for full restoration of salmonid habitat. Treatments in this area would include removal of artificial berms, adding LW to appropriate levels and planting of native conifers consistent with riparian stands. In these areas, LW routing and deposition is a natural process that leads to reactivation of side channels while abandonment of others as the stream migrates across the valley floor. Pockets of diverse habitat is created and flooded with water, providing complex habitat for all aquatic species. Having a stream that can freely move across the floodplain also allows for access to that floodplain during high water events, dissipating stream energy while depositing important gravel and new organic materials. Debris torrents from tributaries contribute critical materials to the channel and are a source for downstream gravel and LW to the Zigzag River and Sandy River.

Water Quality

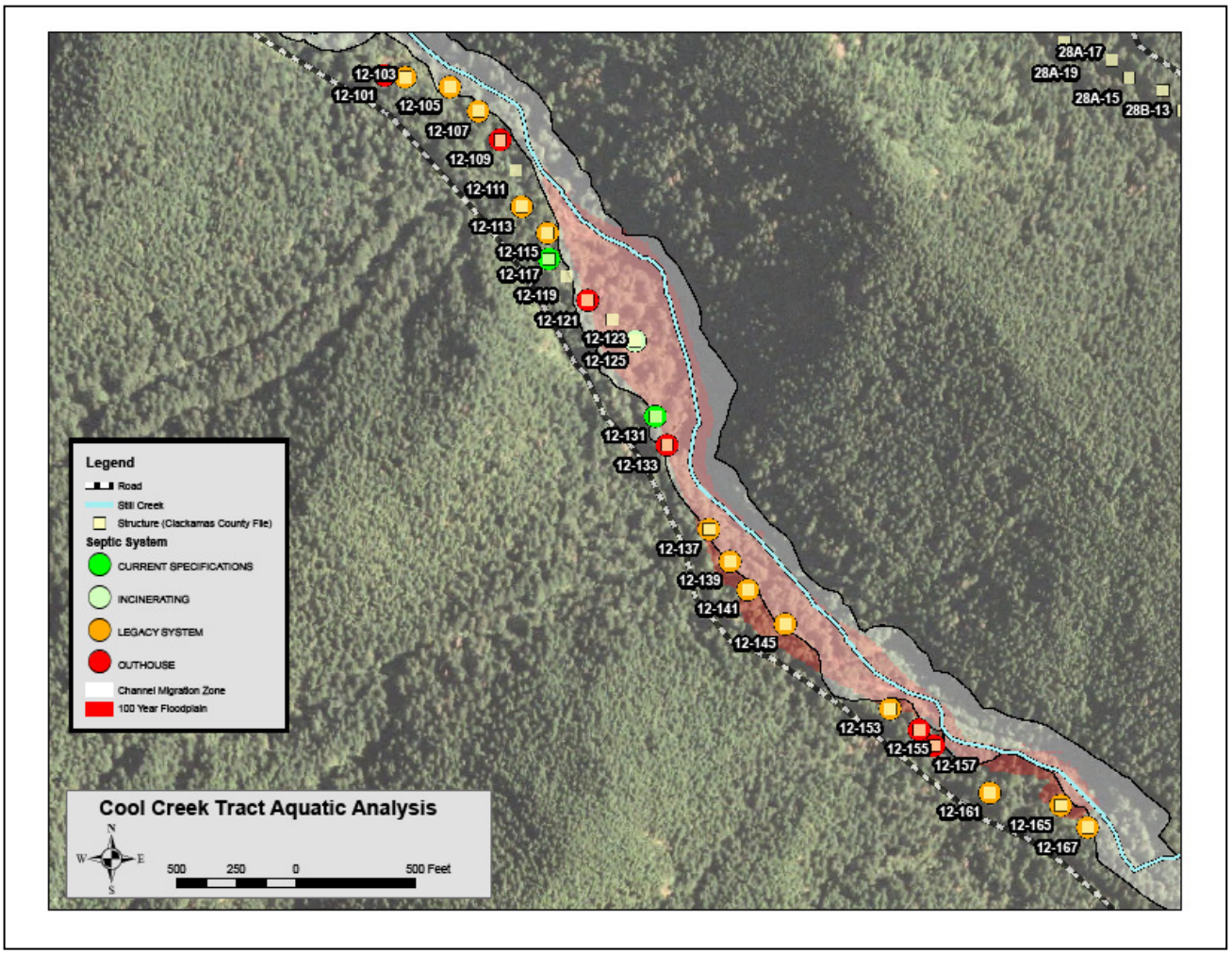
Water quality monitoring has been completed at a coarse scale, mostly above and below recreational residence tracts or only at the mouth of respective tributaries. Usual parameters assessed in these monitoring efforts include various bacteriological parameters to determine compliance with State Water Quality Standards and to assess any increases associated with failing septic systems. The most recent monitoring was completed in the summers of 2006, 2007 and 2008 associated with a study of Salmon Habitat Measurements in Four Clear-Water Upper Tributaries in the Sandy River Basin completed by the University of Portland. For this study Enterococcus (a genus of lactic acid bacteria commonly associated with human fecal contamination) levels were assessed. The 2008 results indicate that the stream stays within State Standards and that there is no statistically significant difference between samples collected above and below the Cool Creek tract. At this scale it is unlikely to pick up individual effects from one or two failing septic systems. Within the 1995 Zigzag Watershed Analysis and the 2004 Zigzag Watershed Analysis there were no adverse effects to water quality associated with Recreational Residence identified. Again, this may be related to the scope or duration of past monitoring efforts.

Recreational residences generally have one of four types of septic systems: outhouse, legacy system, pressure distribution and sand filter. Pressure distribution and sand filter systems are newer types and meet Clackamas County codes. Legacy systems generally include some sort of tank with an associated distribution system. As part of the permit re-issuance process permit holders are required to have their

septic systems inspected to insure that they are functioning correctly. When a cabin is sold, the new owners are required to install a system that meets current Clackamas County regulations. Figure 14 displays known septic system within the Cool Creek Tract.

Substandard systems may cause direct delivery of pollutants to the stream system through interaction with hyporheic flow, side channel or main channel flow. An example of this was documented during the November 2006 flood within the Cool Creek Tract; lot number 121 has an outhouse located near the cabin. During high stream flows the pit for the outhouse was full of water to within two feet of the seat, likely from hyporheic flow. For these reasons, it is highly recommended that for those lots located within the floodplain; all septic systems need to be fully self contained.

Figure 14. Known septic systems within the Cool Creek Tract mapped with the channel migration zone and 100-year floodplain.



Limitations of Analysis

This analysis contains a few limitations that deserve mention. Soils and stream banks in Still Creek reach two are made of alluvial and glacial deposits with terraces of unconsolidated alluvium with moderate to high erodability. Due to unconsolidated materials in this area, modeled results of channel migration may be conservative. Furthermore, model results are limited to the accuracy of the data sets that were used. An example of this was the 10-meter digital elevation model, used for integrated flood plain analysis.

The 95 percent confidence limits associated with estimated stream flows vary from one half to twice predicted peak flows. However, predicted stream flows generated from regional equations fit very well with flood elevations documented during the November, 2006 flood event.

River and stream process are dynamic and complex processes, their inner connections are not fully understood. This assessment used several models, the best available science and local understanding of watershed processes to explain the Still Creek Watershed within the Cool Creek Tract. It is the belief of the two authors of this document that results and findings may be a conservative estimate of potential effects.

Conclusions

Use of Forest Service managed lands for recreation residence tracts located on the Zigzag Ranger District is consistent with current management direction and policy. This analysis has shown that most of the recreational residences, 539 out of 554, are compliant with current management direction. Individual permit compliance issues are being dealt with administratively. All remedial actions must be completed within five years of issuance of the new permit.

Based on this analysis there are several cabins that are located within one or more of following: the 100-year floodplain, channel migration zone and debris flow hazard zone of Still Creek. This poses a significant health and human hazard if the cabin is occupied during a flood event. Their continued use could also pose a significant risk to water quality, fluvial processes and habitat used by three species of fish listed under the ESA. Furthermore, current management direction in the LRMP and NWFP would likely not allow construction or heavy maintenance of artificial structures such as boulder berms or dikes to protect existing infrastructures.

Permittee's with a cabin or other associated infrastructure located within a floodplain are subject to the conditions of Executive Order (EO) 11988 included as part of his/her special use permit. Following is an excerpt of this EO:

> *Floodplain, E.O. 11988: The lands covered in this authorization have been determined to be in a floodplain (E.O. 11988). This authorization is issued with the specific understanding that if the improvements are substantially damaged and made uninhabitable by flood, the authorization shall terminate and the remaining improvements removed within 90 days. Should damage to the improvements not be substantial, they may be repaired and allowed to remain if they can be flood proofed without affecting flows in the floodway. No expansion of existing improvements or*

new improvements will be allowed in the floodway. No claim shall be made against the United States for damage, loss, or termination of authorization due to flood.

Continued persistence of specific recreational residences listed in Table 7 would likely preclude full restoration opportunities of the channel and floodplain of Still Creek reach two and would perpetuate currently degraded baseline conditions. Also, current vegetation management direction such as hazard tree felling and removal would continue. Trees that are identified as hazards are cut down and left on-site to contribute to down coarse woody debris amounts. If felled trees are left in a large pile adjacent to a cabin they can be cut up to provide access to cabins. Frequently, these logs are cut into shorter pieces and used for firewood. Over time, cutting and the piecemeal removal of these trees have left large gaps in the forest canopy and deficiencies in down and in-stream LW.

Table 7. Lots affecting fluvial processes or are at least moderate risk of damage due to debris flow.

Lot number		
121	137	155
123	139	165
125	141	167
131	145	
133	153	

During recent flood events, specifically 2006 and 1999, it was a common practice within the Sandy River Basin for private land and property owners to protect their homes by building berms, dikes or removal of naturally recruited LW without Federal and State Fill and Removal Permits. These actions likely degraded river and habitat conditions by reducing floodplain connectivity, increasing shear stress on the bed and banks resulting in channel down cutting and causing excessive bank erosion. These actions would likely occur when future floods are experienced in Still Creek, though the degree or magnitude is not known.

The Sandy River Basin Aquatic Habitat Restoration Strategy identifies the Still Creek 6th field watershed and more specifically, Still Creek Reach Two, as a high priority area for restoration. By implementing prescribed restoration actions it would substantially lend to recovery of the three species of federally listed fish that inhabit Still Creek. Within the past 10 years there has been great momentum, energy and fiscal resources focused on restoration actions within the Sandy River Basin. By not implementing full restoration of Still Creek now or in the very near future, focus (and likely funding) will move on to other river basins as regional priorities change.

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Appendix A

Example of Lot Summary Form

Individual Lot Form

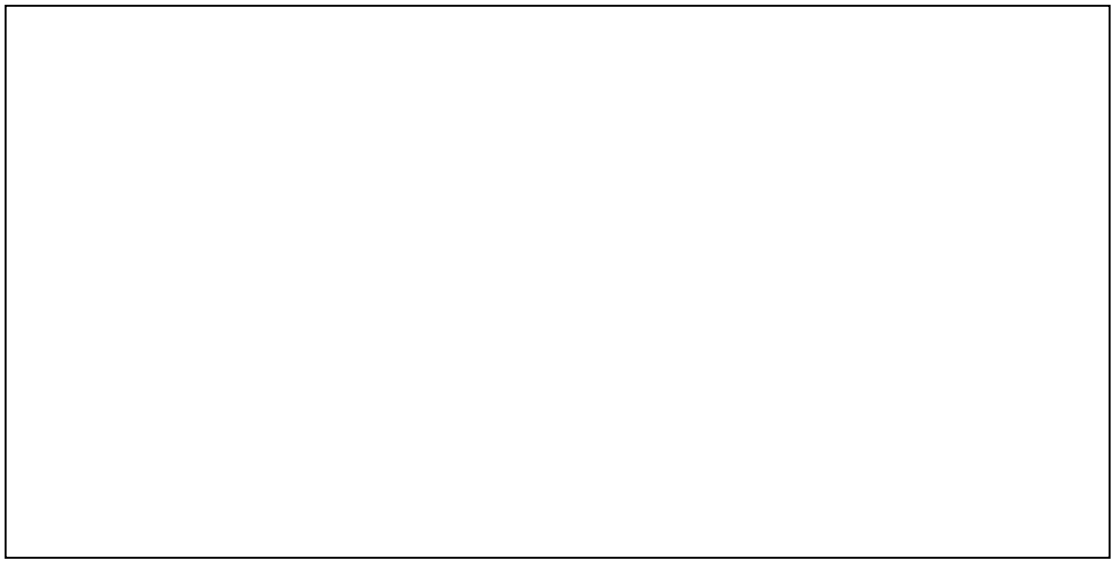
Tract Name:_____ **Lot Number:**_____ **Date:**_____
Surveyor Name:_____ **Road Number:**_____

Fisheries Resources

Lot location along:_____Creek or River, Reach:_____
TES aquatic species present:____ If Yes, what:_____
Structure position in relation to stream channel:_____flood plain
_____1st terrace _____2nd terrace _____other
Approx. terrace or flood plain height from bankfull elevation:_____
Approx. slope distance from structure to bankfull elevation:_____
ID of sewer system: Yes/No Chronic Sediment Source: Yes/No What:_____
Chronic chem. contamination present, Yes/No: What: _____
Structures limiting access to flood plain: Yes/No What: _____
Structures limiting access to channel or off-channel habitats: Yes/No What:_____
Gutters/Downspouts: Yes / No Effect to LWD or potential LWD: Yes/No

Photo. _____
Notes: _____
_____
_____

_____
_____
_____
_____



Site Sketch._____

Conclusion for the Lot:

	Yes	No
Is the Lot consistent with Management Direction		
If no, can it be made consistent?		

Actions to be taken to make tract consistent with Management Direction or actions to improve site conditions:

Appendix B

Example Tract Summary Forms

Tract Form

Tract Name:_____ No. of Cabins in Tract:___ Dates Surveyed:_____
No. of Cabins Meeting Management Direction: ___ Surveyors Name:_____

Fisheries and Hydrology Resources

Mt. Hood National Forest Land and Resource Management Plan (LRMP)

Standard	Description	Does the Tract Exceed Standards? (yes, no or N/A)
Forestwide Standards – Riparian Areas		
FW - 078	Major groundwater recharge areas (e.g. flood plains, riparian areas, and intermittent and ephemeral drainages) shall be managed to maintain natural infiltration and permeability rates.	No
FW-080	Within 100 feet of a riparian management area, no more than 10 percent of a project activity area (e.g. recreation site) should have exposed or compacted soils. (Tract)	No
FW-081	No more than 5 percent of a project activity area shall be in a compacted, puddled, or displaced soil condition. (Tract)	No
FW-082	At least 95 percent ground cover (e.g. vegetation, duff or litter) shall be maintained within all project activity areas. (Tract)	No
FW - 83	Ground disturbing activities should not occur in saturated soil areas.	No
FW-084	Activities within and adjacent to riparian areas should not accelerate sediment delivery to steams, lakes, wetlands, seeps and springs. (Lot)	No
FW –087	Existing aquatic habitat complexity shall be maintained or increased. (Lot)	No
FW –090	Gravel-dominated or low gradient (i.e. less than 3 percent slope) streams shall maintain one or more primary pools	No

	every 5 to 7 (bankfull) channel widths.	
FW –092-103	Is the project maintaining or improving LWD levels, in-stream cover, spawning habitat, riffles, stream substrate, and streambank stability. (Tract)	No
Standard	**Description**	
FW –104	Special aquatic habitat (e.g. alcoves, secondary and overflow channels, ponds and wetlands) and associated subsurface aquatic habitat (hyporheic zone) shall be maintained in natural condition or enhanced in both quantity and quality.	No
FW - 105	At least 95 percent effect ground cover (e.g. adapted trees, shrubs, sedges, and grasses) in a project activity area should be maintained	No
FW - 106	At least 80 percent of riparian management areas shall be maintained with, or restored to, a fully-stocked, multi-layered canopy of old growth and/or mature forest.	No
FW – 113 and FW - 114	State water quality standards for turbidity shall be met. No more than a 10 percent cumulative increase in natural in-stream turbidity should be allowed to result from forest management activities.	No
FW –115	Fish passage should be maintained or improved. (Lot)	No
FW –117	Human-made fish passage barriers should be identified and corrected. (Lot)	No
Forestwide Standards – Fisheries		
FW –137	Fish habitat capability shall be maintained at existing levels or greater.	
FW –138	Impacts on habitat for the management indicator species group (salmonids) shall be determined for each project affecting fisheries, in terms of habitat quality, quantity and distribution.	
Management Area Direction – B6 Special Emphasis Watersheds (Still Creek)		
B6 -008	Where exiting developments are not consistent with riparian and or watershed values, modification or rehabilitation of the site or facility should occur.	
Management Area Direction – B7 General Riparian Area		
B7 -006	Where exiting developments are not consistent with riparian values, modification, rehabilitation, or removal of the site or facility should occur.	

Northwest Forest Plan (NWFP)

Standard	Description	Does the Tract Exceed Standards? (yes, no or N/A)
C-7	Is the Tract located in a Tier 1 or 2 Key Watershed?	No
C-7	Is the Tract located in a non-Key Watershed?	Yes
C-30	Riparian Reserves	
	Are all or portions of the Tract located within 1 site-potential tree height?	Yes
	Are all or portions of the Tract located within the 2nd site-potential tree height?	Yes
	Is all or portions of the Tract located within 1 site-potential tree height of lakes and natural ponds?	No
	Is all or portions of the Tract located within or adjacent to intermittent streams, wetlands less than 1 acre, and unstable and potentially unstable areas?	Yes

Aquatic Conservation Strategy (ACS) of the Northwest Forest Plan

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, up slope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands.

8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.

9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.

ACS Consistency

	Yes or No
Does the Tract meet the ACS goals at the 5th field scale?	
If no, explain why:	

Conclusion for the Tract

	Yes	No
Is the Tract likely consistent with Management Direction		
If no, can the tract be made consistent?		

Lots likely to be meeting Management Direction within this tract.

Road No.	Lot No. (s)	Road No.	Lot No. (s)

Lots that may *not* be meeting Management Direction within this tract.

Road No.	Lot No. (s)	Road No.	Lot No. (s)

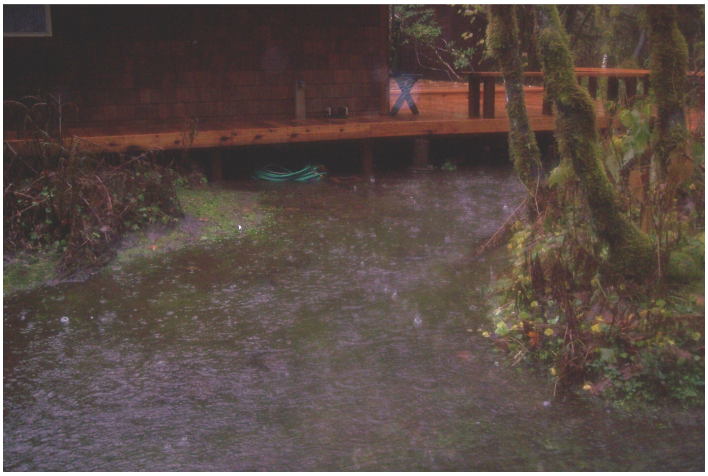
Tract Summary Form

LOT_ID	ADDRESS_1	TRACTNAME	RD_LOT	MAYNOT	FW-78	FW-80	FW-81	FW-82	FW-83	FW-84	FW-87	FW-90	FW-92-103	FW-104	FW-105	FW-106	FW-113	FW-114	FW-115	FW-117	COMMENTS

Appendix C

Photos Taken During November 2006 Flood Event

Lot 125 taken 11/07/06. Note water under deck.



Lot 141 taken 11/07/06. Note water on lot.

Lot 141 taken 11/07/06. Note water flowing from under the deck and house.

Lot 141 taken 11/07/06. Note water under deck.

Lot 63 taken 11/07/06. Water near cabin.

Lot 139 taken 11/08/06. Water in yard.

Lot 139 taken 01/08/09 note water on the lot.

Appendix D

Individual HEC-RAS Model Analyses

HEC-RAS model analyses for the Cool Creek Tract are on file at the Zigzag Ranger District. Because of the large page size (11" X 17") they were not included in this document.

Appendix E

Notes From Permit Files
Cool Creek Tract

COOL CREEK TRACT
ROAD 12 LOT 121

ca. 1958	Construction of cabin completed.
7/1968	Permittee asks Forest Service for advice on where to place cesspool or septic tank since "water is quite near the surface".
7/26/68	The Forest Service stakes approved location for septic tank and drywell on lot.
6/3/71	The Forest Service inquires if permittee would like beavers in side channel on the lot trapped and removed. Beavers are responsible for flooding on lot. Permittee would prefer to leave the beavers in place.
7/3/86	In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.
9/11/86	A footbridge is added to the permit as an authorized improvement.
4/17/89	In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.
1/15/00	E.O. 11988 amendment added to permit.

COOL CREEK TRACT
ROAD 12 LOT 123

1956	Construction of cabin completed.
10/24/72	Permittee is authorized to remove drift logs in Still Creek downstream from lot for use as firewood.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

10/14/86 Footbridge is added to the permit as an authorized improvement on this lot.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1/15/00 E.O. 11988 amendment added to permit.

6/5/02 Permittee notified of permit violations including unauthorized removal of vegetation, construction of a well and construction of a footbridge.

COOL CREEK TRACT
ROAD 12 LOT 125

ca. 1958 Construction of cabin completed.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

9/30/86 Site plan indicates intermittent side channel 35' north of cabin and Still Creek 131' north of cabin. "Spring Creek" is 150' south of cabin.

10/3/86 Footbridge is added to the permit as an authorized improvement on lot.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1996 Intermittent side channel becomes perennial after 1996 flood.

1/15/00 E.O. 11988 amendment added to permit.

8/8/00 Paul Norman responds to permittee's proposed cabin rebuild, domestic water system, and septic system in light of the E.O. 11988 amendment. He recommends that the

existing foundation be replaced with a post and pier foundation rather than a poured foundation; maintaining the outhouse, or installing an incinerating or chemical toilet; and a suitable dry well for gray water disposal. Norman goes on to state that "the Forest Service can not, in good faith, encourage you to undertake large expenditures without cautioning you that future flood events might effect your permit."

COOL CREEK TRACT
ROAD 12 LOT 131

ca. 1966	Construction of cabin completed.
12/4/67	The District Ranger responds to an inquiry by permittee regarding permit. He states that he cannot guarantee that the permit will not be cancelled sometime in the future, though it would be "very unlikely". If the government determined that the land had more value for another use, the permittee would be given several years' notice, "probably 15 to 20", to allow time to write off their investment.
11/1977	Site plan indicates that cabin is approximately 140' from Still Creek.
5/16/78	Cabin selected by the USFS as a model recreation residence that "expresses and blends with the natural forest character".
7/3/86	In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.
4/17/89	In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.
9/19/90	Permittee is directed to allow native vegetation to return between cabin and stream.
9/1995	Lot is flooding. Permittee removes debris that is piling up at anchored fish habitat logs which is causing stream to overflow onto lot.
11/21/95	Permittee proposes to construct 2' high, 40' long dike to protect lot.
11/28/95	High water event. Jeff Uebel (USFS Fisheries Biologist) recommends an immediate assessment of the situation at lots 131, 141, and 145. He predicts that these cabins are threatened by possible significant damage. Event channels stream through lot and onto lots downstream.

2/26/96 The Oregon Division of State Lands authorizes emergency alteration of Still Creek at lot 131 to protect cabins along stream bank (state project no. RF 10522). The work shall be supervised by the USFS.

2/29/96 In a letter to the permittee the Ranger outlines the authorized channel stabilization work. The approved project is less than what was proposed by the permittee. The Forest Service concluded that a greater degree of modification would result in unacceptable fisheries impacts and not provide for any significant additional protection for the cabin. The approved alterations "should provide a reasonable level of protection for your improvements, during smaller, more frequent future flood events". The Ranger offers an option to relocate the cabin on the lot.

3/13/96 District Ranger authorizes permittee to perform additional in-stream work from what was authorized on February 29th.

4/11/96 Photos depict newly constructed flood protection dike.

1/15/00 E.O. 11988 amendment added to permit.

4/6/04 Connie Hamlin noted failed septic tank within 10' of side channel.

4/15/04 Forest Service authorizes excavation of a septic test pit on lot.

2/16/05 Permittee proposes installation of a 1,000 gallon septic tank and an open bottom sand filter system.

4/27/05 The Forest Service authorizes installation of septic system as proposed.

COOL CREEK TRACT
ROAD 12 LOT 133

ca. 1963 Construction of cabin completed.

12/1964 Flood changed the channel of Still Creek at this lot. Flood waters washed under cabin and nearly undermined the footings.

3/18/65 Permittee is concerned with log jam created in the 1964 flood and asks the Forest Service what action it will be taking to return Still Creek to its "usual channel".

4/30/65 The Forest Service is planning to remove the log jam. Some material will be left on the bank to "act as a revetment in the near future". The rest of it will be made available as firewood.

5/7/65 The Forest Service is planning to fall a cedar upstream from this lot to incorporate into the stream bank revetment.

1/1966 Revetment holds during high water event.

2/68 Revetment nearly destroyed by early spring run-off. Permittee suggests gabions be installed.

3/29/68 Forest Service has no funding for gabions but suggests that permittee may be able to purchase and install.

9/22/77 Site plan indicates stream channel is approximately 50' from cabin.

8/26/83 Site plan indicates stream channel is approximately 60' from cabin.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

6/3/96 Permittee contacted the Forest Service and expressed concern with high water and stream course. Approximately 35-40' of the lot was lost. An undated note in the file suggests that Forest Service fisheries later placed logs in the stream channel that mitigated threat.

1/15/00 E.O. 11988 amendment added to permit.

COOL CREEK TRACT
ROAD 12 LOT 137

1960 Construction of cabin completed.

9/16/60 An inspection noted that too much vegetation had been cleared between cabin and stream.

10/21/65 Forest Service uses lot 137 to gain access for a cat to remove "stumps out of the stream".

4/10/86 Site plan indicates Still Creek is approximately 70' from cabin.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream

banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

6/11/87 Permittee notified of fish habitat improvement project in Still Creek that will be implemented in this reach of the stream. Equipment access to stream will be their driveway.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1/15/00 E.O. 11988 amendment added to permit.

7/16/02 Forest Service inspection includes note to buyers: "Please allow vegetation to return to cobble bar, between cabin and creek, and around cabin to eliminate 'lawn-like' look, and to prevent erosion."

COOL CREEK TRACT
ROAD 12 LOT 139

1962 Construction of cabin completed.

10/7/63 USFS inspection noted that there had been too much clearing between cabin and stream.

10/7/70 Permittee is given approval by the District Ranger to perform limited in-stream work in the side channel on his lot. Work must be completed by 10/31/70. The permission suggests that this side channel was originally constructed without authorization.

1/1972 Still Creek shifted its channel into lot during high water event.

2/11/72 The District Ranger requests advice from Headquarters staff on how to deal with Still Creek in this area.

2/22/72 Jay Massey, Fishery Biologist for the Oregon Game Commission; Chuck Whitt, MHNF Fisheries Biologist; and Warren Olney of the Zigzag Ranger District visited the site. Their recommendation, in order to protect spawning gravels, and to protect natural channels and stream banks downstream, was not to allow in-stream work. They did recommend a dike to be constructed along the existing channel.

2/24/72 Richard Ross, MHNF Watershed and Wildlife Staff, concluded that the only way to adequately protect many of the summer homes in the Still Creek drainage would be to construct a flood channel. However he recognized that such action "would be inconsistent with National Forest objectives".

3/1/72 The District Ranger gives approval to the permittee to place riprap along the stream channel and to backfill behind the riprap with topsoil to raise the level of the lot.

8/30/72 Location for riprap dike is selected.

5/22/77 USFS inspection notes that “lawn should be allowed to go natural”.

9/22/77 Site plan indicates that large rocks have been placed along stream bank.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1/15/00 E.O. 11988 amendment added to permit.

COOL CREEK TRACT
ROAD 12 LOT 141

12/12/61 Permittee complains of increase in permit fee. In the complaint he states that he cannot see stream and that there is a “small swamp” between the cabin and the stream.

ca. 1963 Construction of cabin completed.

9/28/66 In a letter to Senator Morse, the permittee complains of $17.00 fee increase to $60.00. Part of their complaint is because cabin is in a “flood danger zone”.

9/22/77 Site plan indicates that stream channel is approximately 50’ from cabin.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

9/8/93 USFS inspection includes following: “Please allow natural vegetation to recover.”

11/1995 High water event. Lattice skirting on cabin was ripped off. Stream entered the old channel upstream around a log jam turning lot into a "raging river".

COOL CREEK TRACT
ROAD 12 LOT 145

5/1964 Cabin under construction.

1966 Correspondence in the files suggest that construction of cabin was completed in 1966.

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1993/1994 Winter high water events sought out historic channel, and damaged cabin and lot.

1996 Still Creek sought historic channel during flood event washing out driveway to this cabin. Cabin also received some damage.

11/10/99 The USFS authorizes construction of a hardened dip in the driveway that will allow high water events in the old channel to wash over the driveway without damaging it.

COOL CREEK TRACT
ROAD 12, LOT 153

4/4/68 USFS inspection suggests that construction of cabin is complete by this date.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

7/13/94 Permit holder describes his seasonal non-potable water source as being a small pump drawing water from Still Creek.

1996 Notes from a phone conversation suggests that permit holder noted major erosion from flood event and is concerned with current course of Still Creek.

1997? An undated note in the files indicate that the permit holder is greatly satisfied with in-stream work that the Forest Service recently completed [Chris Rossel]. Approximately 35-40 of lot was lost in the 1996 flood and the cabin was surrounded by water but did not suffer any damage.

1/15/00 Executive Order 11988 amendment to permit.

COOL CREEK TRACT
ROAD 12 LOT 155

3/22/68 USFS inspection report suggests that construction of cabin is complete.

8/6/69 Log jam in Still Creek is diverting water onto lot.

8/13/69 District Ranger authorizes permittee to cut up log jam and burn.

12/1977 High water event diverts water into lot.

2/7/78 Water running down driveway from hillside onto lot. Trees on lot are being undermined by Still Creek.

2/15/78 In a letter to the permittee, the District Ranger states that the Forest Service objective in dealing with cabins in flood hazard areas is not to interfere with the river's hydrologic processes. He recommends that if a permittee is threatened by the river's natural encroachment, the cabin be moved.

2/22/78 Permittee claims that the Forest Service has obligation to protect cabin from flooding since they permitted it to be constructed in a flood plain.

In a letter to Robert Ziemer, the permittee outlines his issues with how the Forest Service is dealing with flooding issues. Ziemer forwards this letter to Congressman Al Ullman who in turn forwards it to the Chief on 3/13/78 with a request to look into solutions to problem. The permittee, in his letter, stated that the cabins "are on short term leases which can be terminated at the end of the term by the Forest Service. I wouldn't doubt that they have this in mind at the very extreme expense to everyone involved."

3/26/78 On or about this date, 5 trees undermined by Still Creek fell into stream channel.

4/3/78 Forest Service inspects lot and discovers 7 more trees that are undermined.

4/14/78 Forest Supervisor Dale Robertson responds to Congressman Ullman's inquiry.

4/21/78 District Ranger meets with permittee at his summer home to discuss alternatives that would protect cabin. Permittee will be given names of local loggers who can cut hazardous trees.

4/24/78 Forest Service staff examine drainage problems on Still Creek Road.

9/28/78 Permittee asks that Bob Graham of Corps of Engineers take pictures of log jam threatening his lot. John Payne of the Corps delivered pictures to the Forest Service Regional Office on 9/28 with recommendation that the Forest Service "should do something about it".

10/3/78 In a letter to the permittee, the Forest Service responds to the photos taken by the Corps by quoting clause #8 of the Term Special Use Permit:

> "Avalanches, rising waters, high winds, falling limbs or trees and other hazardous natural phenomena in the forest present risks which the permittee assumes. The permittee has the responsibility of inspecting his site, lot, right-of-way, and immediate adjoining area for dangerous tress, hanging limbs, and other evidence of hazardous conditions and after securing permission from the Forest Service, to remove such hazards."

12/15/83 Permittee is presented results of a Forest Service hydrologic study of Still Creek in vicinity of cabin. The study predicts that streambank will continue to erode and a small scale placement of riprap to armor the bank is recommended. Permittee will require a permit from the Oregon Division of State Lands and approval from the Forest Service.

3/4/86 Jeff [Uebel?] prepares a cost estimate of $11,665 for stream bank protection assuming 100' of channel frontage. Project includes rip rap and wing deflectors

7/3/86 In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

4/17/89 In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.

1996 Cabin and lot are damaged during heavy rains as a result of culvert and ditchline failures on road 2612.

1/15/00 E.O. 11988 amendment added to permit.

COOL CREEK TRACT
ROAD 12, LOT 157

ca. 1964	Cabin constructed.
3/15/65	Permit holder notifies the Forest Service that flood has washed away approximately 100' of his lot and the creek is now 20' from the cabin's foundation. The stream bank is continuing to erode. The driveway was also washed out.
4/27/65	The District Ranger notifies the permit holder of the Forest's plans to remove debris from Still Creek and do some channel work.
6/10/65	Permit holder describes how there are three branches of Still Creek in front of his cabin. One is very close to the cabin and the other two are the "old channel". The three channels start about 150' upstream from his cabin. He asks the Forest Service to close the third channel that is impacting his lot.
6/21/65	District Ranger informs permit holder that he believes any high water event will now be diverted into an overflow channel and away from his cabin. The Forest Service may be doing more in-channel work later in the summer.
7/3/86	In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.
4/17/89	In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.
2/1996	Driveway and lot damaged during storm event [drainage problem on road 2612?].
9/1996	The Forest Service repairs road 2612 and replaces road culvert.
5/25/99	Permit holder does not agree with assessing the cabin as being "creek front property" since stream channel is now over 150' away from cabin.
1/15/00	E.O. 11988 amendment to the permit.
3/3/06	Inspection notes that gray water is draining into a ravine that drains into Still Creek.

COOL CREEK TRACT
ROAD 12, LOT 161

ca. 1968	Cabin constructed.
7/3/86	In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.
4/17/89	In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.
1/15/2000	E.O. 11988 amendment to the permit.

COOL CREEK TRACT
ROAD 12, LOT 165

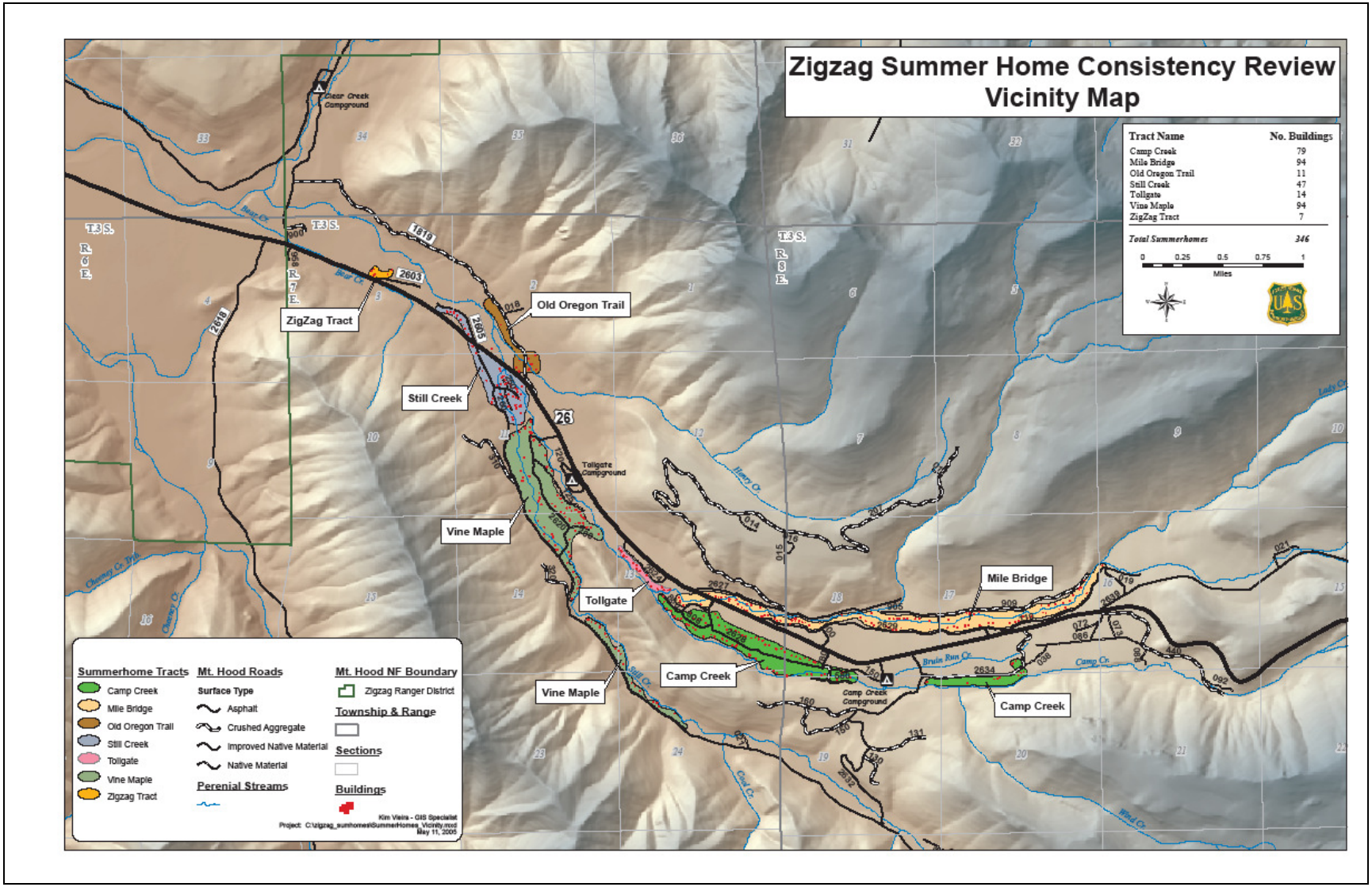
1965	Cabin constructed.
6/27/86	Permit holder notified by the Forest Service that their driveway will be used for access for the fish habitat project in Still Creek.
7/3/86	In a letter to the permittee the Forest Service announces a fish habitat improvement project to be implemented that summer. The project area is from Road 12 Lot 61 upstream to a point above lot 167. The project includes placement of large rocks and logs in the stream. The project was designed to enhance the stability of the stream banks and to assure that work associated with this project would not endanger any cabins from later stream flooding or bank erosion.

COOL CREEK TRACT
Road 12 Lot 167

3/10/64	In violation of the permit, construction of the cabin has begun without authorization.
9/16/70	Construction of the cabin is complete.
1981	In their appeal of their new lot assessment, the permit holder points out that the cabin is constructed “on old creek bed and floods a portion of the year”.

4/17/89	In a letter to the permittee the Forest Service proposes road 2612 reconstruction at m.p. 2.0 including rip-rapping base of road fill, re-establishing slope and channel contours, revegetation, and large rock groins. A flood overflow channel and upstream stream deflectors may also be constructed.
1/15/2000	E.O. 11988 amendment to the permit.

Appendix F
Map of Recreational Residence Tracts



Appendix G

Examples of Desired Future Conditions For Still Creek Reach Two

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Following are photos depicting desired future conditions for Still Creek reach two. Photos of Clear Fork of the Sandy River are for similar channel type, forest type and elevation within the Sandy River Basin.

Clear Fork of the Sandy River,2006.

Still Creek with Chinook Salmon redd 10/05.

Clear Fork of the Sandy River, 2006.